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Electronics

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THE WORLDWIDE TECHNOLOGY WEEKLY

OCTOBER 28, 1985

PARALLEL PROCESSING
WHY A SHAKEOUT NEARS

TOO MANY ARCHITECTURES
CONFUSE THE CUSTOMER
PAGE 32

AI PUTS THE PUNCH IN A RELATIONAL DATA BASE/48

TECHNOLOGY UPDATE 4: THE ACTION IN MANUFACTURING/52

"We did it!"

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OCTOBER 28, 1985 VOLUME 58, NO. 43

Electronics

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Cover by Art Director Fred Sklenar

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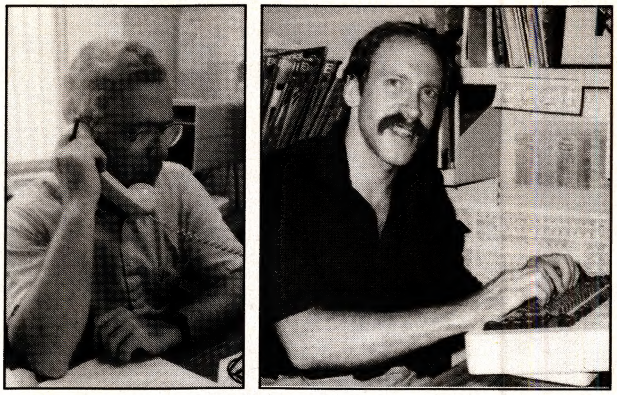
MANUFACTURING MAVENS. Jerry Lyman, left, and Dave Weber wrote the update on manufacturing in this issue.

The annual Technology Update is now in its 11th year as a staple of *Electronics*, and so is one of the authors of the update on manufacturing in this issue. Jerry Lyman, our packaging and production editor, wrote one of the articles on advances in manufacturing that starts on p. 52. Jerry arrived at *Electronics* in November 1974 with a solid background in engineering and magazines. His work here since then has earned for him the sobriquet Mr. Packaging—a person known and respected in the industry he covers.

For Jerry, the most striking change during his decade-plus of writing about semiconductor packaging and production is the magnitude of the growth that the industry has undergone. "I've seen the semiconductor-equipment manufacturing industry grow from about 120 companies in 1974 to more than 1,000 today," he says. "And at the same time that it has expanded in numbers, it has become a tremendous force technologically and economically.

"Not only that, but the industry's influence is going to continue to grow as integrated circuits become smaller and more complex and as the IC finds its way into more and more equipment. The semiconductor industry drives the rest of electronics, but there wouldn't be a semiconductor industry without the support of the manufacturing-equipment people. And even in today's depressed economy, they are pouring money into research and development. There will be bigger developments yet to come."

The other half of this week's update team, David M. Weber, is our industrial and consumer editor. He is a New Yorker who would just as soon be outdoors—preferably climbing a mountain. Dave has scaled peaks in Oregon, the Sierras near Lake Tahoe, and the Shawangunks in New York State—and last Christmas spent the holiday cross-country skiing in Swedish Lapland.

Dave has made himself a specialist in automated production, and he insists that someday there will be more personal robots than computers in the home. In fact, he says, "I feel an affinity for robots because they are becoming more like people—without the faults."

Laurence Altman

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MC68020-Still the leader.

Performance, architecture and availability make it the preferred 32-bit system solution.

Recent system-performance measurements painstakingly carried out by current users on production hardware are documented in the latest Motorola benchmark brochure, BR322.

Performance superiority of the MC68020 over the closest challengers is clearly established. No 32-bit announced in 1985 will change that, or these facts.

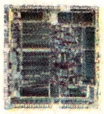
No other Floating Point Coprocessor offers the performance, broad-based functionality and flexibility of Motorola's MC68881.

No other Paged Memory Management Unit gives the power and flexibility to the operating system of Motorola's MC68851.

And, Motorola's MC68020, MC68881 and MC68851 are all available now.

Of course, the decision is yours. Do you take the clear performance leader that's available now and go to market with systems that outperform their competition? Or, do you wait for something else, only to find it's too little, too late.

The highest-performance 32-bit system solution—MC68020.



In your drive for product leadership, reliance on an outdated architecture or failure to design in the highest performance can be fatal.

Motorola's MC68020 and powerful peripherals are the only 32-bit solution that provides both the architecture and system performance you need to stay ahead. The performance of all three 32-bit system-solution devices is maximized by advanced Motorola HCMOS manufacturing, which gives them reduced power dissipation for more reliable operation and greater chip densities for higher frequencies. The present MC68020 norm is 12.5 and 16.67 MHz, and 20 MHz operation is coming.

Designed in by leaders around the world.

Here are just a few of the companies setting the pace around the world with MC68020-based products:

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Cal Tech	Hypercube Supercomputer
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Charles River Data	Business Supermicro
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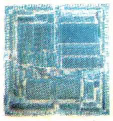
Honeywell	Multi-tasking Computer
Mitsubishi	Numerical Control/ Robotics
NCR	Multi-user Bus. Syst.
Sanyo	Graphics Workstation
Siemens	Telephone Switching System
Sun Microsystems	Tech. Prof. Workstation
Tektronix	A I System

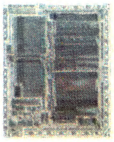
This dozen and many others already have systems introduced and in production. Over 500 more are now working to design in the MC68020. Don't be outperformed. Keep up. Start now with the Motorola high-performance 32-bit system solution.

Powerful coprocessor system elements.

The MC68881 Floating Point Coprocessor (FPCP) and MC68851 Paged Memory Management Unit (PMMU) supplement the MC68020 in the most powerful solution for high-performance 32-bit systems.



The PMMU efficiently supports a demand-paged virtual memory environment for multi-user and multitasking systems. It has an on-chip translation cache, and performs logical-to-physical address translation. The MC68851 also has unique features such as variable page sizes, optional tables for DMA support, and breakpoints and support for extended logical or physical caches, making it the best choice for systems requiring memory management.



Motorola's MC68881 is the only FPCP that meets and exceeds the IEEE floating point standard. It performs a full selection of transcendental and non-transcendental functions —root values, trig functions, exponentials, logs and more—in addition to the basic add, subtract, multiply and divide. No external software or extra ROM and RAM are needed. All functions are in hardware.

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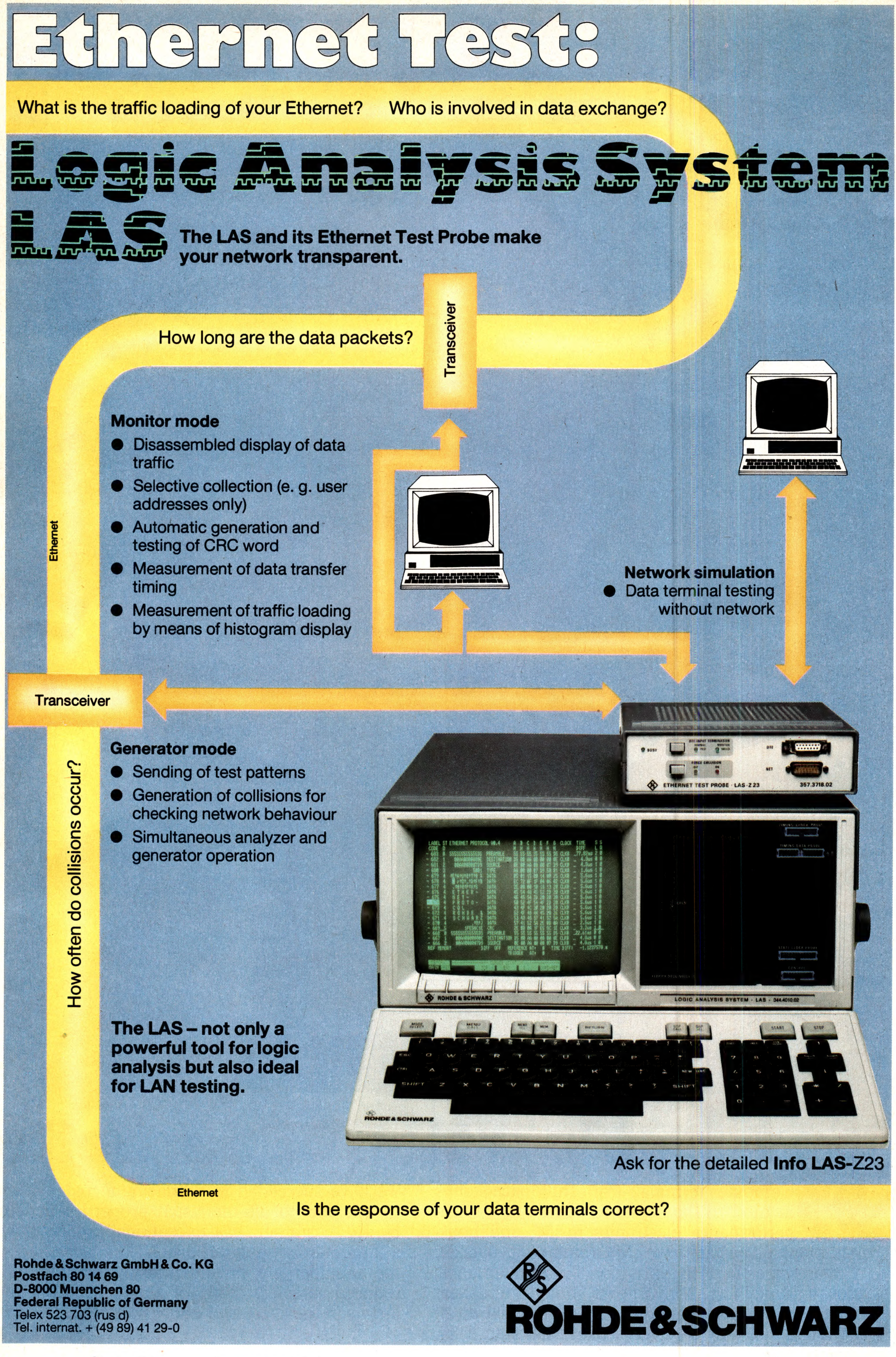
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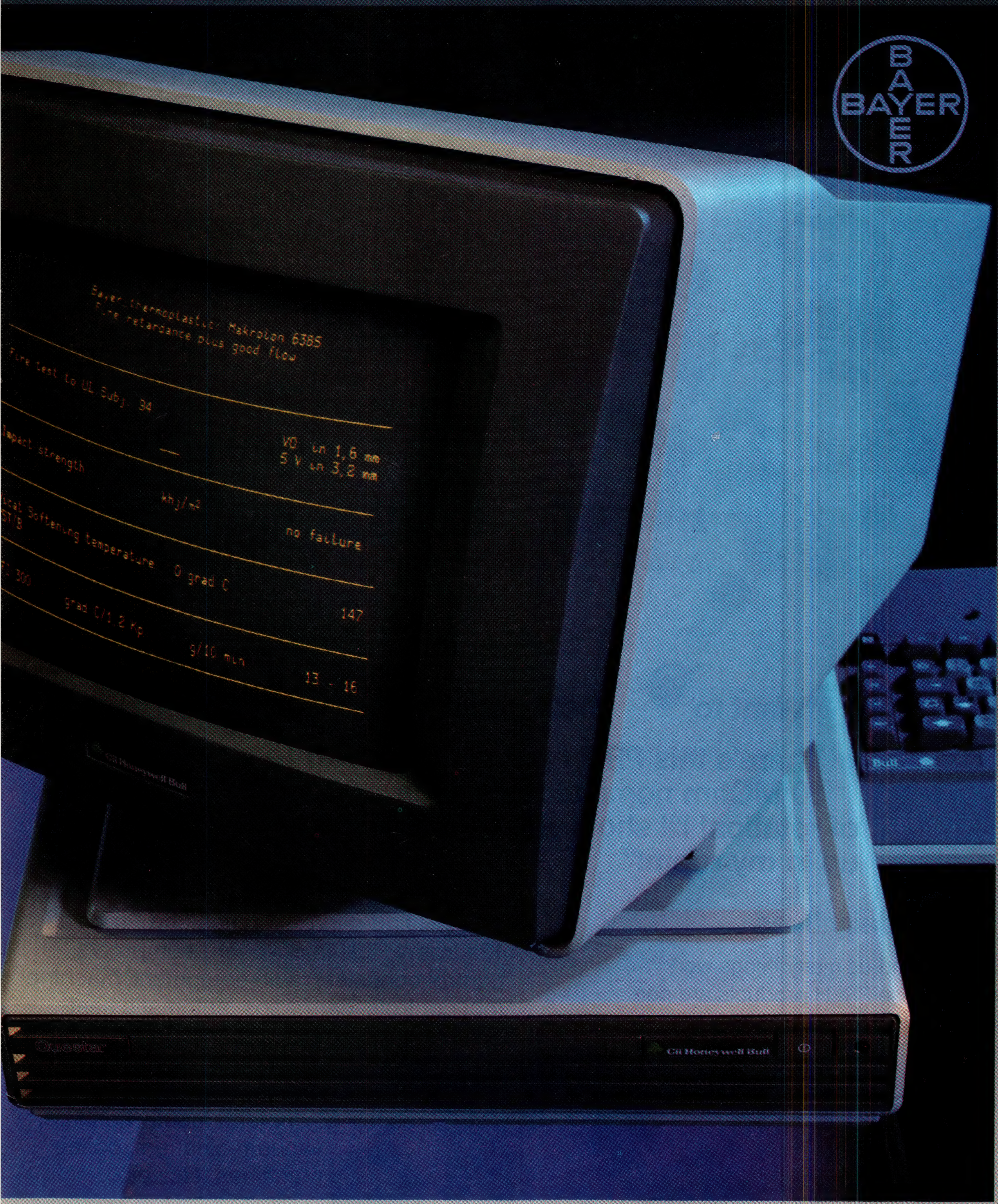

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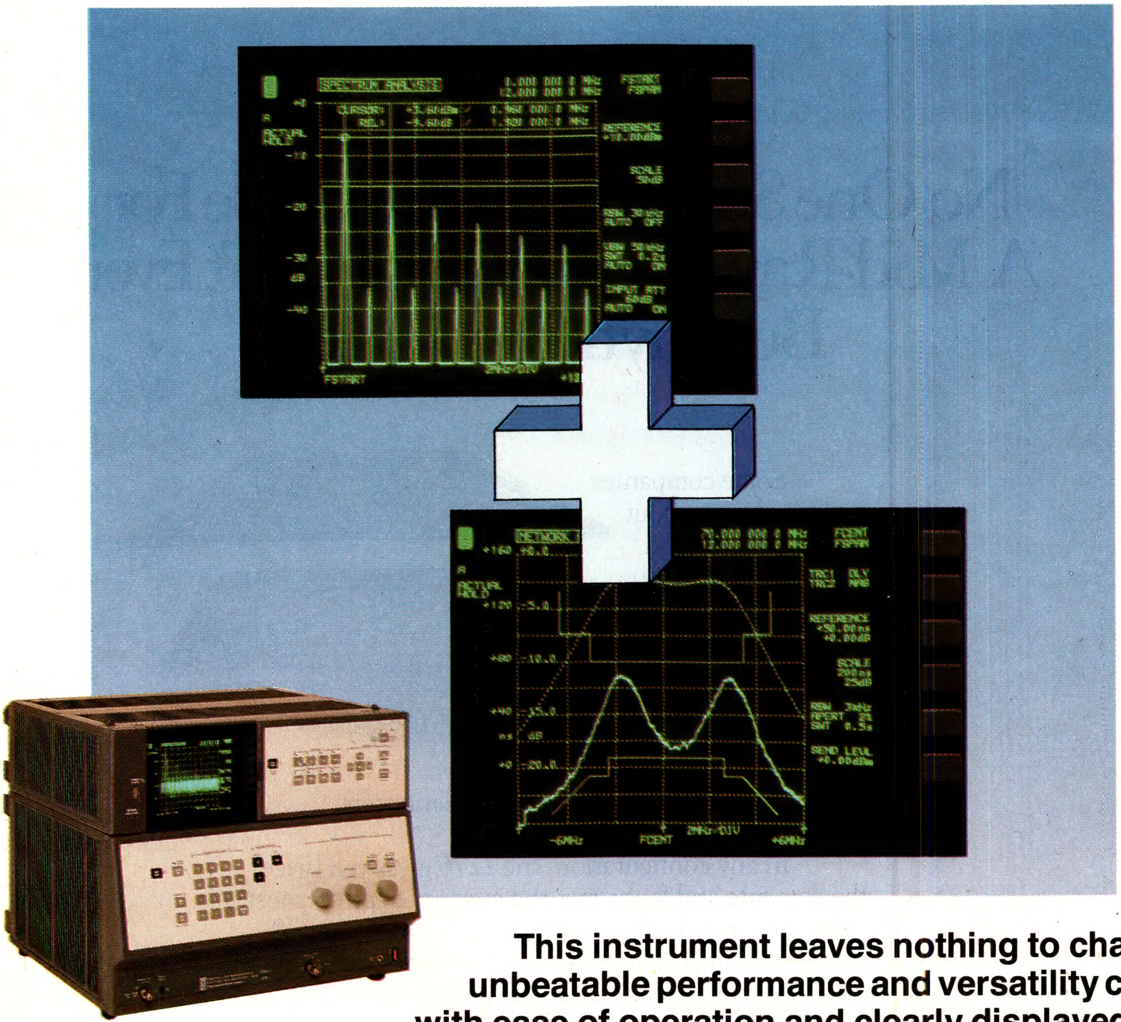

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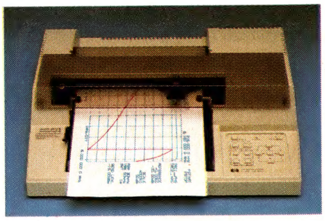

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ELECTRONICS NEWSLETTER

DOD MAY FORCE 100% TESTING OF ICs IN MILITARY SYSTEMS

Expect a tougher stance by the Department of Defense on inspection of semiconductors by military-systems contractors. The Pentagon will soon print a manual designed to encourage 100% inspection and testing of incoming components and may refuse to grant any more waivers on 100%-testing clauses written into many major weapons-systems contracts. The inspection could add 30% to 40% to components costs, sources say. But the DOD counters that some 3% to 12% of the semiconductors that wind up in equipment are defective, and the cost of replacing them is 10,000 times that of screening them out. ☐

SUPPLIERS OF CHIP-MAKING EQUIPMENT PLAN GLOBAL EXPANSION

If you can't beat them, join them. Suppliers of semiconductor-manufacturing equipment and materials are following the lead of many chip makers by moving production closer to major geographic markets, says a survey released last week. The poll, conducted by Semiconductor Equipment and Materials Institute Inc., shows that a major round of global musical chairs is under way. Some 63% of the responding Japanese suppliers plan to expand operations in the U. S. over the next 12 months. About 45% will do the same in Europe. Meanwhile, 38% of the U. S. companies plan expansions in Japan, and 36% say they are moving more manufacturing to Europe. European suppliers are on the move, too: 50% plan to expand in the U. S. and 32% plan more activities in Japan, says the survey by SEMI. The poll drew responses from 300 companies and SEMI plans to conduct it annually. ☐

SIGNETICS TOOLS UP WAFER-FAB LINE FOR COMPACT-DISK PLAYERS

Employees of Signetics Corp., Sunnyvale, Calif., must have heard digitally mastered music when the company announced recently it would not shut down Fab 15, the fabrication facility for 4-in. MOS wafers scheduled to close in 1986. Swamped by demand for its popular compact-disk music players, Signetics' parent company, Philips of the Netherlands, has enlisted Signetics to gear up Fab 15 for full production, or 20,000 wafers per month, as soon as possible to help supply components for the systems. Signetics said it was calling back to work some 100 workers of the formerly 350-strong workforce already laid off as a result of the earlier decision to close the line. Signetics will make the entire MOS chip set used in the audio disk players. ☐

INTEL-NEC MICROCODE BATTLE TAKES NEW TURN

The copyright battle over microcode between NEC Corp. and Intel Corp. has taken a new twist. Until now, NEC claimed microcode cannot be copyrighted—and even if it could be, the Tokyo company says, it didn't copy Intel's 8086 or 8088 microcode in its V20 and V30 microprocessors [*Electronics,* Aug. 26, 1985, p. 12]. The companies sued each other over the piracy issue, and NEC slapped the Santa Clara, Calif., company with another lawsuit in June when Intel asked NEC distributors to attach copyright stickers to chips that NEC second-sources for Intel as μPD8086 and μPD8088. At the time, NEC claimed Intel's copyrights were invalid. But last week, NEC asked the U. S. District Court in San Jose, Calif., to make a summary judgment on the matter, claiming Intel invalidated its copyrights by not requiring manufacturers to affix Intel copyright notices to such chips at the start. (NEC's second-source agreement with Intel was the result of an earlier copyright-infringement dispute, settled out of court in early 1983.) If the court rules that Intel's copyrights are invalid and in the public domain, both lawsuits will be settled in NEC's favor, and it will be legally free to market the V-series chips. ☐

Street-wise designers: use the ultimate in speed and power control.

New Harris 82C85 Static Clock Controller operates in four low-power modes.

The new Harris 82C85 static CMOS clock controller/generator dramatically reduces power consumption in static CMOS systems by giving you four distinct operating modes.

- Full Speed for top performance.
- Slow mode for low power and continuous operation.
- Stop Clock for low power and instant restart.
- Stop Oscillator for minimum power standby operation.

Designed specifically for 80C86 and 80C88-based systems, the 82C85 responds to a software HALT command, stopping all system clocks automatically. The 82C85 can also be controlled by a flexible independent START and STOP control structure.

With a full DC-8MHz operating frequency range, the 82C85 allows you to control your system power and performance, tailoring them to your exact requirements.

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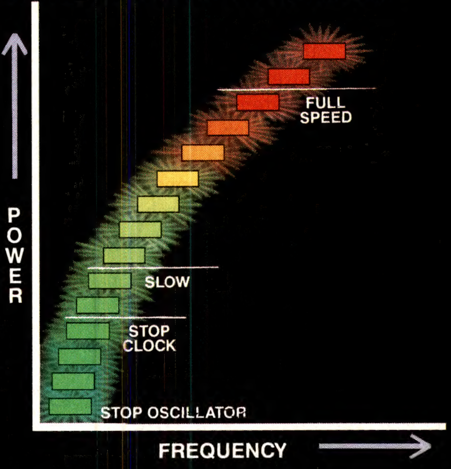

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Circle 70 on reader service card

dation of pulse shape caused by noise pickup, crosstalk, ringing, or impedance mismatch, greatly simplifying any design job, according to the company. It appears that extension of the technique to microwave and millimeter-wave frequencies will soon be feasible.

The board was described at the Oct. 22 International Electronics Packaging Society's meeting in Orlando, Fla., by Leonard Schieber, Multiwire's product development manager. Another way to embed coaxial lines in a board was developed by System-Kontakt GmbH of Bad Friedrichshall, West Germany, but it calls for very complex manufacturing [*ElectronicsWeek*, Oct. 1, 1984, p. 20].

CONSTRAINTS. Ordinarily, coaxial cable is bulky and hard to handle. To make such wire work on a board, Multiwire developed a very small 50-Ω coaxial wire. The wire had to meet stringent design constraints. The characteristic 50-Ω impedance dictated the ratio of the wire diameter to the shield diameter, and the outer diameter of the shield had to be small enough to fit Multiwire wiring machines. Maximizing propagation speed required an insulator with the lowest dielectric constant available. Crosstalk specifications put a lower limit on shielding thickness. And current-carrying-capacity needs put a lower limit on wire diameter.

Multiwire's Advanced Manufacturing Group developed a 50-Ω coaxial wire with an outer diameter of 9.5 mils and an inner conductor of 3.1 mils. The insulation is either polytetrafluoroethylene (PTFE) Teflon or expanded Teflon (also known as GoreTex).

This wire is used in a Multiwire wiring machine, which applies the wire to a substrate covered with a proprietary adhesive. After all circuits have been wired, the board is panel-plated, a process that connects all shields and actually makes them a part of the ground plane, minimizing return-current effects and eliminating ground drops in the drain wires.

Clearance areas are made in the wire-termination areas, and the ends of the wires are stripped. The board is then coated with a dielectric layer, holes are drilled at the wire ends, and the boards are plated to provide a through-hole connection to the inner conductor.

With the GoreTex dielectric, which has an effective dielectric constant of 1.3, time delays in the wiring can be as low as 1.2 ns/ft. Attenuation can be as low as 4.9 dB/ft at 1 GHz. PTFE Teflon, with an effective constant of about 2, degrades these numbers slightly.

Wiring densities slightly better than standard Multiwire boards are achievable: multiple layers of coaxial and unshielded leads may be wired on the same board. Techniques are being developed for connecting microwave chips embedded in the board's ground plane.

Sample boards for GaAs circuitry are being tested at beta sites. One test sample has a wiring pattern with a density equivalent to three coaxial conductors squeezed between 18-mil holes drilled on 60-mil centers. *–Jerry Lyman*

COMPUTERS

AMDAHL FINALLY RESPONDS TO SIERRA

SUNNYVALE, CALIF.

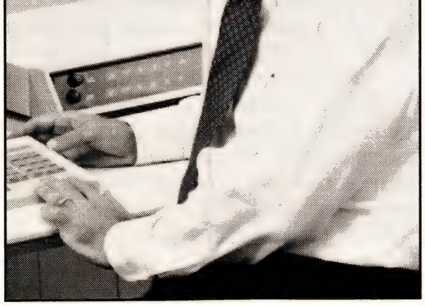
Like the tortoise starting the race, Amdahl Corp. finally took off after IBM last week, introducing its response to the Sierra series of mainframes that IBM Corp. unveiled in February.

To counter the effects of its late start, Amdahl promised first delivery in the second quarter of 1986 on a Sierra-family plug-compatible that IBM doesn't even make: the Amdahl 5890-300, billed as 35% more powerful than IBM's 3090-200 (which executes 28 million instruction per second) at the same price.

IBM hasn't yet announced a 300 member of the Sierra series. But it is reportedly marketing its 200 aggressively—offering early delivery and delayed payments—to boost fourth-quarter profits, so the Amdahl 300 could lose some of its edge. In addition, by the time it reaches the market, National Advanced Systems Inc.'s AS/XL series 200 and 400 compatibles (built by Hitachi Ltd.) will be there as well. And Amdahl's four-processor top-of-the-line 5890-600 won't be available until the fourth quarter of 1987.

Despite Amdahl's late start and its declining share of the plug-compatible mainframe market, the Sunnyvale company refused to be stampeded. Its previous 580 mainframe series missed its announced delivery date by more than four months, which cost Amdahl some believability. This time, "we wanted to be sure of the delivery date," says president John C. Lewis. Amdahl has four engineering models of the 5890 in test. "We could ship in two months if we had to," says vice president David Anderson.

"Amdahl's technical specifications look good, and the high end is higher than anything IBM is talking about," says analyst Anne-Marie Berg of Paine Webber Inc. "But our question is: will it be too late? IBM is already packing the market with 200s, it will have the 400 by early in the second quarter, and it will announce a 100 model soon. If the machines are too late, what's the point? When you compete with IBM, timing is a major factor."



ON TIME. Amdahl's Lewis says the 5890 mainframe will be delivered on schedule.

But Amdahl's timing may be just right for a mainframe market that is beginning to open up, counters James Renalds, an analyst with the San Jose, Calif., market-research company Dataquest Inc. "With IBM moving up the 400 and shipping sizable quantities of the 200, I think we are seeing an indicator—not tremendously significant, but an indicator—of an upturn in large-system shipments. We can anticipate that Amdahl will capitalize on the initial movement of the market." Plug-compatibles make up about 10% to 15% of the mainframe market, with Amdahl accounting for two thirds of that but losing share.

WAITED. Renalds believes that Amdahl could have announced earlier but chose to wait and evaluate response to the Sierra. He points out that Amdahl now offers the widest performance range in a mainframe line: from 7.54 mips in its 7840 to 75 mips in the 7890-600.

The Amdahl line also includes the 5890-200, rated equal in performance to the IBM model 200 and 15% less expensive. The 200 will not ship until the first quarter of 1987. The 200 and 300 are dual processors with from 64 to 256 megabytes of memory and 32 to 64 input/output channels; the 600 has 128 to 512 megabytes of main memory and 64 to 128 channels. In minimum configurations, the 200 costs $4.25 million, the 300 $5 million, and the 600 $9.33 million.

The processors are built from 1,000-gate emitter-coupled-logic arrays that switch in 350 ps. Each processor has its in a year as the major low-power simple-matrix screen: the "super-twist" nematic LCD, which uses crystals that turn 270° rather than 90°. Not only is contrast improved with the crystals, but Sanyo has also greatly shortened display response times by stepping up the drive voltage.

Plasma-display vendors also came on strong at Osaka. Fujitsu Ltd. became the third Japanese company to enter the plasma-display race with its new orange-colored plasma display panel. The 640-by-400-dot display measures about 9 in. diagonally and has a relatively high resolution of 75 lines/in.

LOWER-PRICED. Fujitsu has not yet fixed a price for its ac-driven plasma panel. But if it is even close to the $837 price tag suggested by one senior Fujitsu researcher, the product could pose problems for Dixy Corp. of Tokyo. Dixy, a Sony Corp. spinoff that specializes in plasma displays, has samples of its dc display, which has a resolution of 85 lines/in., for a little over $1,100.

NEC Corp. also exhibited a simpler character-oriented plasma display that cannot yet do graphics. When the unit gets into volume production in two years, NEC engineers estimate that its price will be more than $1,000, three times that of a comparable LCD screen.

Some companies, notably NEC and Futaba Corp., are clinging tenaciously to vacuum-fluorescent-display technology. VFDs, the kind of charged phosphorous displays used in many car dashboards, have been largely abandoned because of screen-addressing problems.

Futaba showed two graphics-capable models, a 320-by-240-dot monochrome display screen and a 4.3-in. seven-color display. Marketing is a few years off. Perhaps to avoid an embarrassing comparison, NEC had a low-resolution 4.5-in. color VFD hidden off to one side in a black viewing box.

Fujitsu plasma display has resolution of 75 lines per inch

A bevy of electronics companies—including Epson, Fujitsu, Hitachi, and Seiko—hawked their new thermal printers. Hitachi Ltd. unveiled a prototype color thermal printer that uses a three-color three-step overlay process. This model is relatively slow, rolling out a 512-by-480-dot print in 1 min 20 s. By contrast, Epson Corp. exhibited a prototype that prints a one-step picture of about the same size (2.9 by 3.6 in.) in only 25 s. Yet speed is not everything: the Hitachi printer has a superior resolution, at 150 dots/in., compared with 100 dots/in. for the Epson unit.

ENERGY-EFFICIENT. Both printers convert an analog video signal into a digital signal and send it through a graphics processor, which coordinates 64 shades of four colors—black, yellow, cyan, and magenta. Both machines use an ink-evaporation technique, but Hitachi's is more conventional: a heated printer head with printing needles punches characters out of a disposable color tape cartridge. Epson uses an inkwell cartridge, heating only the outflowing ink film instead of the whole printer head. Epson engineers claim that this method is two thirds more energy-efficient than conventional heated-head methods.

Fujitsu, Seiko Instruments and Electronics Ltd., and several other companies exhibited black and white thermal printers with resolutions as high as 175 dots/in. *–Jonathan Joseph*

MANUFACTURING

EPA: VALLEY FACES MINIMAL TOXIC RISK

PALO ALTO

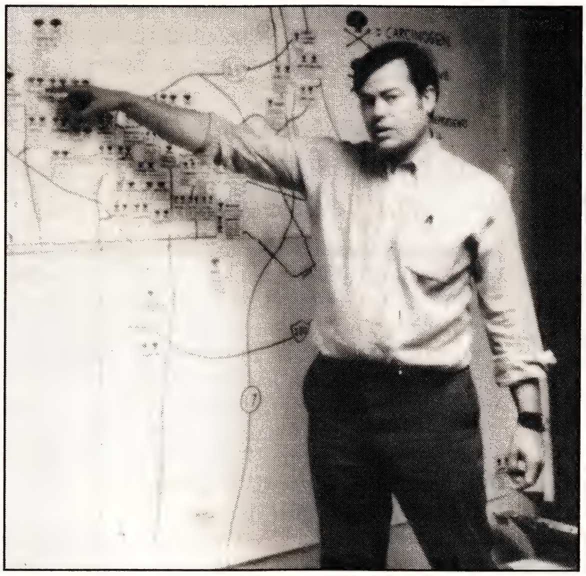
The toxic chemicals used in the semiconductor industry pose little cancer risk to Silicon Valley residents, says the U. S. Environmental Protection Agency. At most, one Silicon Valley resident every 30 years will die of cancer from drinking contaminated groundwater, according to the first draft of an EPA study aimed at assessing the public-health risk of the chemicals.

Toxic chemicals used to disinfect drinking water are higher cancer risks than chemicals that seep into groundwater from underground industrial tanks, according to the report, entitled the Santa Clara Valley Integrated Environmental Management Project, released in mid-October.

These preliminary results pleased the Semiconductor Industry Association, but got mixed reviews from some industry sources and a negative reception from the Silicon Valley Toxics Coalition, a leading watchdog of industry spills. This group says the report ignores employee risks and downplays the danger of more than 100 chemical spills that have been already chronicled on the premises of high-technology companies in the Santa Clara Valley [*ElectronicsWeek*, March 18, 1985, p. 32].

The report was expected six months ago, but the EPA says the unanticipated complexity of data gathering and compiling caused a delay. Such reports mean a lot to semiconductor companies, some of which spend millions of dollars annually in cleaning up spills and for environmental liability insurance.

Contaminants that can cause cancer, their amounts, and how much the public is exposed to them were all figured into the death-rate statistic. The report indicated, however, that its low estimate assumes that spill cleanups will continue.



UNHAPPY. Toxics Coalition president Ted Smith says the EPA report on Silicon Valley "leaves something to be desired."

Most chemicals used in the semiconductor industry, such as the solvents TCA (1,1,1 trichloroethane) and TCE (trichloroethylene), are stored in underground tanks. These organic solvents, used in vapor degreasing, are responsible for cancer and birth defects and for systemic illnesses, according to Safeware Inc., a Santa Clara, Calif., company that has developed a data base on toxics used in the electronics industry.

SIA president Thomas D. Hinkelman, in a prepared statement, claimed that the study's findings were "very reassuring," adding that the chemicals used in the semiconductor industry had been attacked as serious threats to public health only by industry critics and not by the scientific community. The SIA hired attorney Frank J. Fahrenkopf, chairman of the Republican National Committee, to meet with EPA officials about the report before it was released officially.

The EPA says that regulatory programs and cleanup efforts alof building an effective missile defense. But Weizenbaum believes that computer scientists are closer to 75-25 against the possibility of building a trustworthy system.

At MIT and elsewhere, petitions denouncing the Star Wars proposal as unfeasible are receiving support. Some opponents are signing petitions vowing not to participate in the program. Parnas and other critics say that once begun, SDI will develop momentum of its own regardless of feasibility and that the multibillion-dollar effort will starve more valuable projects.

The academic opposition does not affect the program, Ionson asserts. But, he adds, "I'm trying to isolate [participants] as much as possible from the political turmoil." *–Craig D. Rose*

INDUSTRIAL

IEEE TO CONSIDER INTEL'S BITBUS AS A STANDARD

PHILADELPHIA

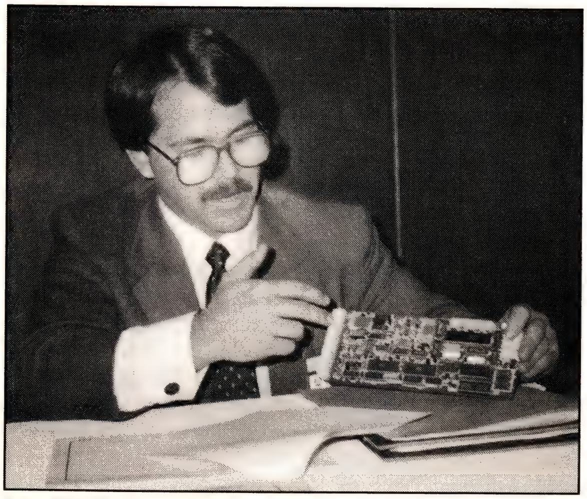
Intel Corp. put a board-level product behind its proposed Bitbus standard for low-level factory communications at the Instrument Society of America meeting in Philadelphia last week. Citing growing support for the proposal, the company said Bitbus will be considered by a working group of the Institute of Electrical and Electronics Engineers meeting in December and again in March 1986.

The board, designated the iRCB 44/20, is an analog input/output controller for the Bitbus that accepts inputs from a variety of sensors and provides outputs for servos and other devices controlled by analog signals. As a part of its overall strategy for establishing Bitbus as a standard, Intel is using the board to illustrate the intended uses of the low-cost, low-speed, twisted-pair serial Bitbus.

Bitbus is not intended to compete with networks based on the Manufacturing Automation Protocol, sponsored by General Motors Corp., but to provide factory communications at architectural levels below those where MAP functions. Instead of linking factory stations or work-cell controllers, as MAP-based links do, the 2,400-b/s Bitbus carries sensor and actuator data from microcontroller to microcontroller in distributed data-acquisition and control systems. A microsystem controlling such a system could be tied to higher levels of a factory-automation system by MAP-based communications.

Richard M. Bowles, product-line manager for Intel's OEM Modules Operation in Hillsboro, Ore., stresses the proposed IEEE standard will not compete with MAP, but complement it. "We made it clear to General Motors that we intend to make Bitbus compatible with MAP because it will be able to move sensor and actuator data to higher levels in the MAP protocol. What we want to do with Bitbus and the new IEEE standard that we're proposing is address a level of factory automation that we believe exists underneath MAP's physical level."

OPEN SYSTEM. "There are alternatives to Bitbus, like Allen-Bradley's Data Highway, but they're all proprietary," says an IEEE spokesman, who requested anonymity. "The beauty of Intel's plan is that it supports OSI [the seven-layer open-systems interconnection reference model used in MAP], so you're not locked into Intel's products."



BOARD LEVEL. Intel's Bowles expects the Bitbus-based 44/20 analog I/O card to serve sensor-based industrial systems.

As Intel sees it, the MAP concept promotes the optimum work-cell interconnection for handling large amounts of information [*Electronics*, Sept. 9, 1985, p. 26]. For example, MAP addresses the problem of instructing a robot's arm or a numerically controlled drill press to move in accordance with the overall plan of a work-cell controller—usually a factory-hardened personal computer. But there is a still lower level of interaction on the factory floor—that of communicating information about temperature, pressure, and other physical parameters in a process or manufacturing operation.

"We want to help the Honeywells, Allen-Bradleys, and Siemenses of the world," says Bowles. "The main problem for suppliers of controllers is the lack of an appropriate standard at the sensor level for integrating environmental information with the higher levels of factory automation."

Now that most automation vendors are committing to the chip products that implement MAP communications, suppliers of sensors and programmable controllers need to bypass the cumbersome software-based interfaces now used to communicate quickly enough to support real-time applications. Bitbus, which conforms with RS-485 electrical specifications, allows users to trade some of its 2,400-b/s synchronous transmission speed for greater link length.

The first of an eventual array of products designed to support sensor-level communications, the iRCB 44/20 board contains a 12-MHz 8044 microcontroller, 16 input channels, two output channels, and two sockets for static random-access or erasable programmable read-only memory. On-board preprocessing of analog data—such as that obtained from sensors—reduces the amount of information that needs to be sent to the host processor, an important feature in the noisy electrical environment of a factory floor.

The board can be programmed by the user to determine how much sensor data is transmitted. "There's no need to update temperature information more than a few times an hour for most manufacturing operations," says Bowles. "And the fact that the 44/20 accepts programming in both ladder language and Basic makes it easy for workers on the shop floor to define the parameters of the sensor data they need, as well as to compile statistical information on the physical characteristics of a given process." *–David M. Weber*

COMPANIES

IS MOSTEK'S DEMISE ONLY THE START?

NEW YORK

The semiconductor slump has claimed its largest—but probably not its last—victim as time, money, and patience ran out for Mostek Corp., which ranked as the nation's No. 6 chip maker last year. United Technologies Corp. shut down its Carrollton, Texas, semiconductor division on Oct. 17.

Now, industry analysts say a bunch of small U. S. chip makers could face a fate similar to Mostek's in the coming

SEND MONEY. Esprit director Cadiou expects to have funds available next year for a few new projects.

od. The high cost of air travel in Europe compared with the U. S. is partly to blame, according to the panel.

Esprit's own communications system, called Eurokom, was also judged inadequate by most project participants and the panel called for improvement. It is essentially a Telex system for handling short messages, and thus many researchers are using communications utilities running under the Unix operating system as well as facsimile equipment. The use of English as the working language was said to have caused no significant problems, however.

U. S. ROLE. The report did not mention the role of multinational corporations in Esprit, but "every organization that has the facilities of an industrial organization—manufacturing, marketing, and research—in Europe is welcome to participate in Esprit," says Pannenborg. European units of such U. S. multinationals as Digital Equipment, IBM, ITT, and AT&T—through its joint venture with Philips—are involved in Esprit but not in leadership roles.

Half the money for Esprit's precompetitive research projects comes from EC matching funds. Barely two years into Esprit's first five-year phase, about 80% of the $615 million of matching funds has been used by the 110 projects started in 1984 and 95 chosen this year. Each project must have at least two industrial partners from at least two countries.

Jean Marie Cadiou, the European Communities' Esprit director, said he hoped to be able to put out a limited call for new projects in 1986 using funding from projects that fall by the wayside. He was addressing an audience at the Building the European Electronics Industry conference held in Brussels in mid-October.

The reviewers said Esprit was generally well managed, but urged the commission to end payment delays that ran as long as six months and to change its costly proposal-evaluation procedures. Companies say they spend too much developing full-fledged proposals, 75% of which are eliminated due to budget restraints.

The panel also found that for all except standards projects, there were generally too many partners. For Esprit's second phase, it suggested more funding and that projects have no more than five partners. Warnecke also suggested that public research institutes might become subcontractors of companies, to stress the industrial nature of the research. The panel said the property-rights question remains cloudy and should be clarified.

For the second phase of Esprit, the panel recommended that the organization set up a handful of large demonstration projects that involve end users of the technology. Although most of Esprit should remain distributed, with work taking place in many countries at once, the panel recommended establishing a few regional "centers of excellence" to bring researchers together.

The panel's reviewers say that Esprit should keep concentrating on precompetitive research, leaving product development to industry and other projects such as the French-backed Eureka, which remains largely undefined. Jean Marie Carlier of France's Industry Ministry told those at the private seminar that Eureka won't be slowed by the consensus-building necessary for Esprit projects. He said that while Esprit does a good job in giving minimum funding to many projects, Eureka will spend more money on a limited number of them. *–Joyce Heard*

TELECOMMUNICATIONS

FRENCH AIM TO CHANGE EVERY PHONE NUMBER

PARIS

If all goes according to plan, France's telephone network will have its potential subscriber capacity doubled virtually overnight. The only hitch is a strike threatened last week by several unions of workers that serve the French Direction Générale des Télécommunications, which devised the ambitious plan.

The scheme, planned for implementation on Oct. 25, calls for lengthening every French phone number from six or seven digits to eight. The aim is to alleviate bottlenecks caused by an antiquated numbering system designed for the French network at a time when it served fewer than 10% of the 24 million subscribers it connects today.

Going to 8 digits will double system capacity

The relevant French labor unions, always touchy about being asked to do anything outside the terms of their fixed contracts, bristled at the thought of their members having to work Friday evening and part of the following weekend. One possible result of a strike is temporary regional communications isolation. It could be impossible to place calls between some regions of the country because once an exchange has been modified to the new numbering scheme, it can only make calls to or receive communications from exchanges that have been similarly modified.

DGT officials soft-pedaled the problem last week, saying that it would be resolved by the critical date. If so, it would mean that all was in place for the French telephone authority to realize an operation that it claims is unprecedented in telecommunications history: on the stroke of 11 p.m. on Oct. 25, every telephone number in the country would change without the interruption of any calls in progress at that time.

DIVIDE AND CONQUER. To manage this, 22,000 phone-system technicians were—strike excepted—to be on duty throughout the country's telephone exchanges. Before the critical moment, they were to have taken advantage of the low level of traffic normal for a Friday evening to divide each exchange into two parts: one to temporarily handle all traffic, the other blocked from the system and modified in accordance with the new scheme.

At 11:00, the first half was to be blocked to incoming calls and all new calls routed to the already modified half of the exchange. The technicians were then to spend part of the weekend adapting the first half of the exchange. For electromechanical exchanges, positions of jumper wires would have to be changed. The modification to digital exchanges is all in software.

The technicians' other job was to replace the standard dial tone so that on Monday morning, subscribers would be greeted with a recorded message reminding them, "Attention, nouvelle numérotation" or "Careful, new numbering scheme." *–Robert T. Gallagher* analyzers and optical time domain reflectometers. More precise optical power meters — the list goes on and on.

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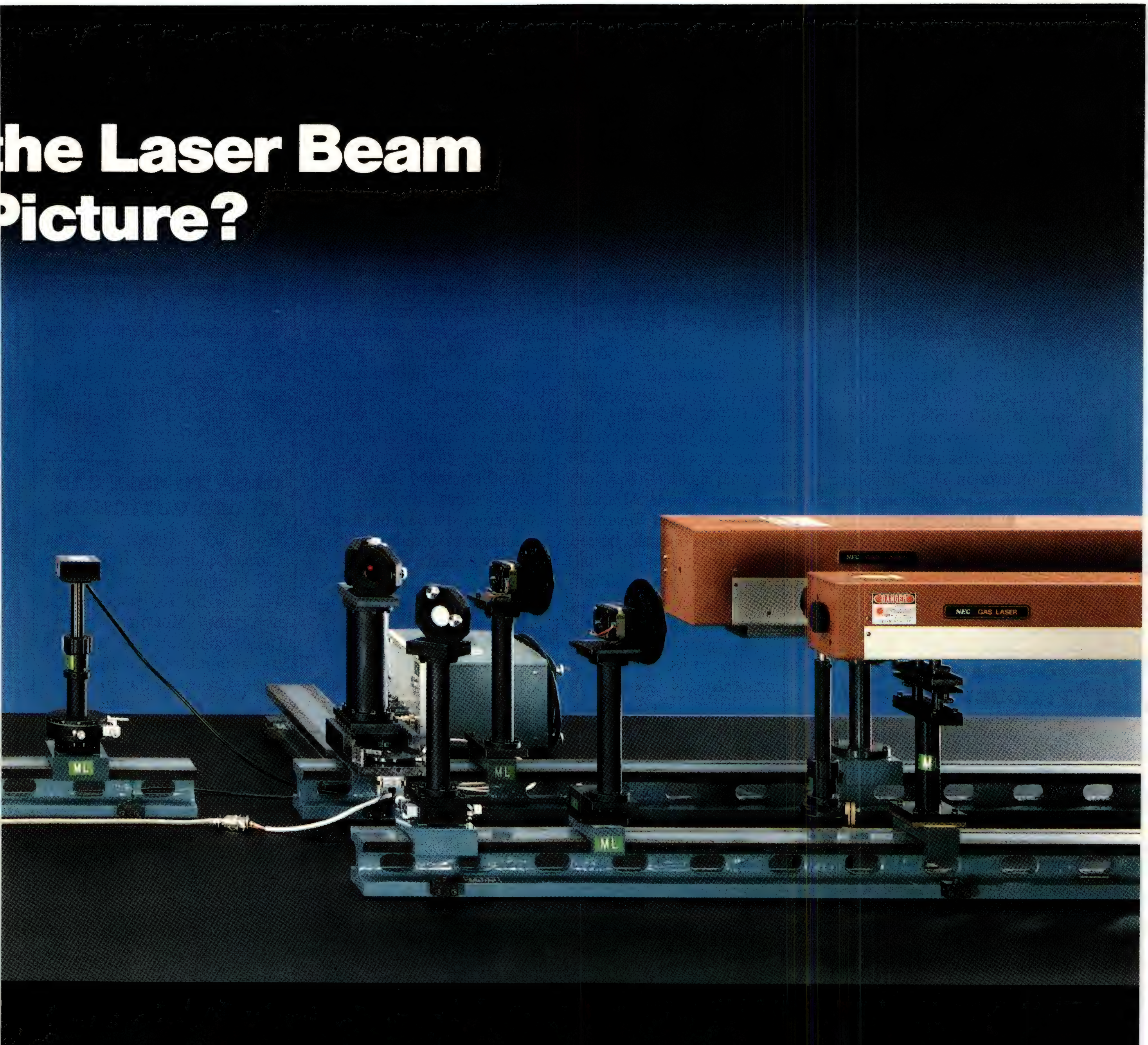

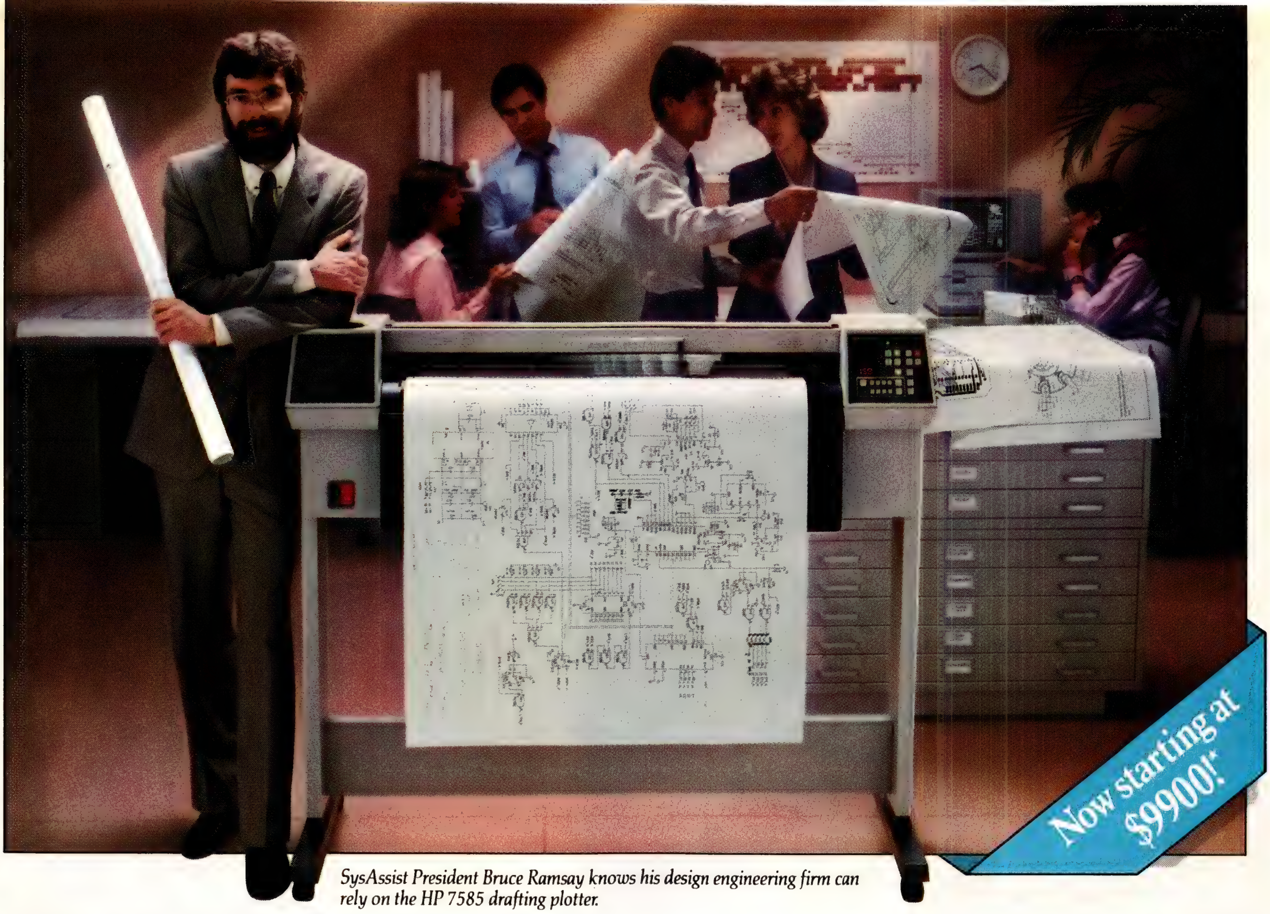
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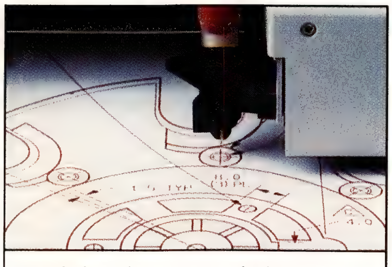

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V20/V30 FEATURE EXTENSIVE CMOS PERIPHERALS.

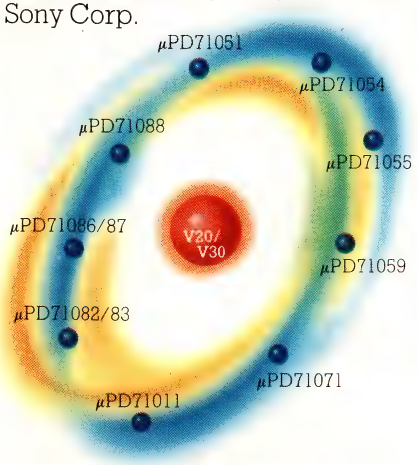
The first 16-bit members of NEC's V-Series CMOS microprocessor family are available with CMOS peripherals. The 8-bit external bus V20 and full 16-bit V30 fit into most existing systems and upgrade performance substantially.

The V20 and V30 feature dual data bus architecture and other hardware refinements to provide outstanding speed. The 101-instruction set includes bit operations, bit field operations, packed decimal operations and stack manipulations. Power consumption rates a low 300mW in operation and 50mW for standby.

Comprehensive CMOS peripherals complement CMOS V20/V30. A CMOS coprocessor (floating point processor) and advanced DMA controller are well under development.

System performance is further boosted with a multi-tasking Real Time OS. Development tools include an In-Circuit Emulator, Relocatable Assembler, Pascal and C compilers.

The V20 and V30 are to be alternately sourced by Zilog Inc., and Sony Corp.



LARGE-CAPACITY INFORMATION DISPLAY PAGER.

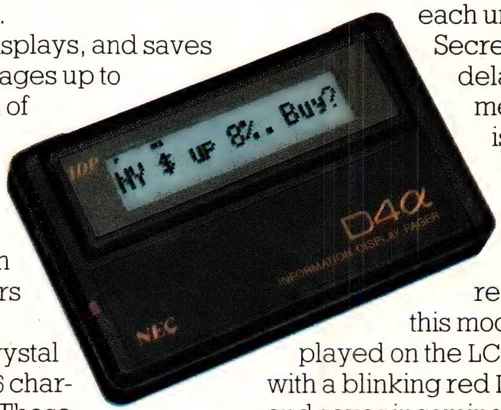
The new NEC D4α Information Display Pager packs state-of-the-art technology into a credit card-sized unit weighing only 100 g (3.5 oz).

It receives, displays, and saves a total of 12 messages up to a maximum total of 416 characters. The maximum single message length is 352 characters. Each message appears on the 5 × 7 dot matrix Liquid Crystal Display (LCD), 16 characters at a time. These features enable detailed messages or instructions to be communicated to the IDP user.

Up to eight current messages can be saved and recalled from the PORTAL memory. An additional four important messages can be selectively shifted to the VAULT memory, which protects them from being overwritten.

The two unique addresses assigned to each unit provide both information display and priority tone-only services to the users.

One of four optional alert modes is selectively programmed into each unit. The "Silent Secretary" mode delays received messages until it is convenient for the user to review them. Also, the number of messages received while in this mode will be displayed on the LCD. "Visual Alert", with a blinking red LED, displays and saves incoming messages in memory. "Quiet Alert" sounds a low-level alert tone. "Vibration Alert" blinks the LED and vibrates while it displays and saves incoming messages.



NEC TO SUPPLY FIVE EUTELSAT AND TWO SMS EARTH STATIONS.

As part of the European Communications Satellite (ECS) System, NEC is supplying earth stations for five member nations of the European Telecommunications Satellite Organization (EUTELSAT). Austria, Portugal, Switzerland and Turkey have ordered complete satellite communications systems, including TDMA/DSI (digital speech interpolation) terminal equipment. NEC has already supplied to Belgium a high-performance 18-meter diameter dish antenna and low-noise amplifier subsystems.

The latest digital technology will be used for telephone transmission to effectively use satellite transponders. The TDMA/DSI system will permit each station to transmit for a fraction of a second using the whole bandwidth of the transponder. The EUTELSAT series of satellites also forms a special network called the Satellite Multi-Service (SMS) System primarily for business users. NEC has also received orders for two SMS and two TV uplink earth stations from Norway.

NEC

made as one piece, thus eliminating the welding of separate parts. Highly automated microprocessor-controlled production equipment processes sheet metal as it comes off the coil into finished profiled plates. With cutting, bending, and punching performed in one cycle, 50 of these plates are made each minute. Robot trucks guided by cable networks in the floor move parts around the plant as needed.

The company's success depends heavily on this high level of automation. In contrast to the consumer-electronics industry, where large volumes are common, the numbers of packaging systems that commercial electronic makers need are much smaller, as Gunther Schroff points out. "Thus to get volume, we must tap the potential of the world market. And to stand up to [international] competition, we must stress streamlined manufacturing to produce at competitive prices," he says.

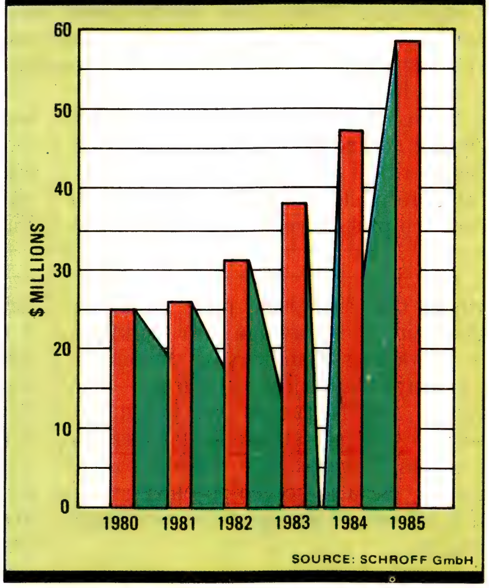
This strategy has served the company well (see chart). Worldwide sales have risen uninterruptedly during the past decade, from $6 million in 1975 to $47 million last year. Increases in annual sales during the past two years have been better than 23%, which is well above the growth of the commercial electronic sectors the company serves. Sales this year should be about 25% over last. Profits have kept pace with sales.

In West Germany, the company claims a 25% share of the market for 19-in. packaging systems. If 19-in. systems based on the Eurocard are considered by themselves, the share is even higher. Despite heavy competition, the company has also become the foremost producer in West Europe, where its market share is around 20%.

Schroff pegs the 1985 West European market for 19-in. systems and related accessories at $225 million. West Germany, which checks in as the continent's biggest user, accounts for a 30% share of that market. It is followed by Great Britain with 23%, France with 20%, Italy with 8%, and the rest of Western Europe with 19%. Industry sources estimate the size of the U. S. market at $500 million to $700 million, which explains Schroff's interest in penetrating this area more deeply.

Serving as the base for expansion into the French market is a production facility founded in 1968 in Betschdorf in eastern France. In Great Britain, Schroff bought T. Foxall & Sons Ltd., in Hemel, Hempstead, in 1978 and turned the ailing metalworking company into a high-productivity manufacturing site catering to the British market. Schroff also has sales offices in Japan. *–John Gosch*

SCHROFF'S SALES HAVE GROWN STEADILY



SOURCE: SCHROFF GmbH

GETTING READY. Chairman Gunther Schroff thinks increased automation is the key to success for his enclosures.

BOTTOM LINES

EXECUTIVE HIRING STARTS UPSWING

The poor state of business in the personal computer and semiconductor industries helped slacken demand for high-tech executives in the third quarter, according to a survey by Korn/Ferry International, a New York executive search firm. But "signs of a resurgence in hiring in the fourth quarter are already apparent," says Robert LoPresto, managing partner of the company's Palo Alto, Calif., office. "Firms in data communications and the military- and defense-electronics sectors are actively recruiting senior managers," he reports, as are startups that must add managerial muscle "to survive in a competitive marketplace and continue to grow."

ECAD COMPLETES SECOND FUNDING

Ecad Inc., the Santa Clara, Calif., maker of computer-aided-design software, completed a $3.25 million second round of financing. The company says it will use the funds as general working capital. "The current semiconductor-industry recession has had a negligible impact on Ecad's sales," claims president Glen M. Antle. "Our market niche, integrated-circuit design, is not as susceptible to fluctuations as other nonresearch-and-development segments of the industry."

DATAQUEST ANALYSTS START COMPANY

Two former market analysts from Dataquest Inc., the San Jose, Calif., market researcher, have created Aspect Telecommunications Corp. to integrate new features in special-purpose telephone systems for niche applications. The Menlo Park, Calif., startup raised $3.5 million in its first round of financing. James R. Carreker, formerly senior vice president, and Carol Snell, recently vice president and director of the Dataquest Telecommunications Industry Service, are two of the company's founders. A third founder is John D. Myers, an independent consultant in Dallas. All three formerly worked for Datapoint Corp.

DASA CORP. TO BUY MDS OPERATIONS IN UK

Dasa Corp., a Stoneham, Mass., supplier of telephone-dialing equipment, has agreed in principle to acquire all the UK operations of Mohawk Data Sciences Corp., Parsippany, N. J. The purchase price was not disclosed. MDS-United Kingdom had fiscal 1985 revenue of $7 million.

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MANY ARCHITECTURES CROWD PARALLEL-PROCESSOR MARKET

Company	Product	Price	Parallelism	Connectivity	Memory	Processor
Accelerated Processors	Model 10	$88,000	4 to 12 groves of 8 ALUs	reconfig-urable	N. A.	N. A.
Alliant Computer Systems	FX18	$270,000	up to 20	bus	global, up to 64 megabytes	64-bit CMOS gate array
Ametek	System 14	$75,000 up	16 to 256	Hypercube	local, up to 256 megabytes	16-bit 80286/80287
Bolt, Beranek & Newman	Butterfly	$40,000 up	1 to 256	switching system	shared and local	16-bit MC 68000
Denelcor	HEP 1	$1 million to $3 million/ execution module	1 to 16 execution modules	shuttle network	global	64-bit ECL
ELXSI	6400	$600,000	up to 12	bus	global, with local cache, up to 800 megabytes	64-bit ECL gate arrays
Encore Computer	Multimax	$114,000	up to 20	bus	global, local, up to 32 megabytes	32-bit NS 32032
Flexible Computer	Flex-32	$150,000 up	up to 20/box, up to 2,480 total	bus	global, local, 98 megabytes/cabinet	32-bit NS 32032
Gemini Computers	Trusted Multiple Microcomputer	$47,500 up	1 to 8	bus	shared, local, up to 128 megabytes	16-bit 80286
Intel Scientific Computers	iPSC	$150,000 to $520,000	32 to 128	Hypercube	local, 288 megabytes	16-bit 80286/80287
International Parallel Machines	IP-1	$50,000	1 master processor, up to 8 processors	cross-bar-like switch	global, up to 40 megabytes	32-bit
Loral Instrumentation	Dataflo	$65,000 up	5 to 256 data-flow processors	bus	shared, local, up to 14.5 megabytes	16-bit NS 32016
Meiko	Computing Surface	$220,000 to $300,000	up to 128	four nearest neighbors	local, 48-K bytes/ 4 processors	32-bit Inmos T414 transputer
Multiflow Systems	N.A.	VAX range	multiple register	N. A.	global, more than 1 gigabyte	gate arrays
Ncube	Ncube/Ten	$100,000 up	16 to 1,024	Hypercube	local, up to 160 megabytes	32-bit custom VLSI
Saxpy Computer	Saxpy-1M	$2 million	32 processors	parallel systolic	shared, up to 512-K bytes	32-bit custom
Sequent Computer Systems	Balance 8000	$60,000	up to 12	bus	global, up to 28 megabytes	32-bit NS 32032
Sequoia Systems	Sequoia System	$200,000	up to 64	bus	global, up to 252 megabytes	16-bit MC 68010
Thinking Machines	Connection Machine	N. A.	64,000 to 1,000,000	Hypercube	global, 500 megabytes	1-bit custom

SOURCE: *ELECTRONICS*

"When it comes to taxonomy, there is a proliferation of terms that we think is necessary to stamp out," complains David Rogers, vice president of Sequent Computer Systems Inc. of Beaverton, Ore. Rogers, a conference panelist who discussed technology trends, urged the NSF and attending researchers to do as the NBS has asked: devise methods to benchmark parallel-processing schemes against a battery of programs.

The architectures to be benchmarked and classified range from a handful of tightly coupled parallel processors sharing the same memory on multiple buses to thousands of loosely coupled processors connected by dedicated internodal communications paths.

About half of the entries are based on custom chips, both CMOS and high-speed emitter-coupled logic; the rest use 16- and 32-bit commodity microprocessors. Word sizes can range from 1 bit in the Connection Machine from Thinking Machines Inc. to 240-bit instruction words and 64-bit large-data words in the Cyberplus from Control Data Corp.

Prices are also all over the ledger sheet, ranging from $50,000 to millions of dollars. Though many systems are from startups, some come from divisions of large companies (see table). Also in the race are Masscomp, Perkin Elmer, Arete, Icon Systems & Software, Myrias Research Motorola Information Systems Ltd. in Canada, Norsk Data of Norway, ITT, and Goodyear Aerospace.

At the Golden meeting, vendors of parallel-processing hardware tossed about comparisons of systems even though they were matching apples and oranges. To many attendees, it was more like comparing fruit salads.

"I would be happy just knowing how many machines there are out there, what they can do, what kind of software is available, and how they can fit into the scheme of things," says James Bottum, staff associate for the NSF computing centers. "We are looking at establishing a comprehensive national network with major nodes being the supercomputer centers, but the other nodes could be remote-access centers using some of these systems based on new computer [architecture] technologies."

Some observers maintain that the

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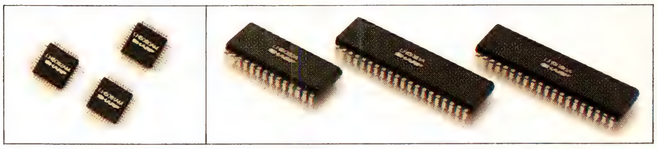

Z80 CMOS Family (8-Bit CMOS Microcomputers)

Type No.	Description	Features	Package
LH5080 LH5080M LH5080A LH5080AM	Central processing unit	● 8-bit microprocessor compatible with LH0080 (Z80 CPU) of NMOS process. ● Fully static operation. ● 10mA (TYP.) supply current. ● 2.5MHz (MAX.) clock frequency. (LH5080, LH5080M) ● 4.0MHz (MAX.) clock frequency. (LH5080A, LH5080AM)	40 DIP 44 QFP
LH5080L LH5080LM LH5080AL LH5080ALM		● Equivalent to LH5080. ● Power-save mode with the execution of HALT instruction. ● 50μA (TYP.) in power-save mode.	
LH5081 LH5081M LH5081A LH5081AM	Parallel I/O controller	● Compatible with LH0081 (Z80 PIO) of NMOS process. ● Fully static operation. ● 2mA (TYP.) supply current.	40 DIP 44 QFP
LH5081L LH5081LM LH5081AL LH5081ALM		● Equivalent to LH5081. ● Power-save mode with the execution of HALT instruction. ● 50μA (TYP.) in power-save mode.	
LH5082 LH5082M LH5082A LH5082AM	Counter timer circuit	● Counter/timer device which is compatible with LH0082 (Z80 CTC) of NMOS process. ● Fully static operation. ● 2.5mA (TYP.) supply current.	28 DIP 44 QFP
LH5082L LH5082LM LH5082AL LH5082ALM		● Equivalent to LH5082. ● Power-save mode with the execution of HALT instruction. ● 50μA (TYP.) in power-save mode.	

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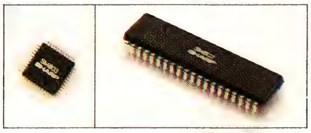

Z8 CMOS Family (8-Bit CMOS 1-Chip Microcomputers)

Type No.	Cycle time MIN. (μS)	Supply voltage (V)	Current consumption TYP. (mA)	No. of inputs/outputs	ROM (bit)	RAM (bit)	Subroutine nesting level	Package	Remarks
SM803	2.2	5	2.4	32	4096x8	144x8	Uses RAM area	40DIP 44QFP	Z8 CMOS type (pin compatible to NMOS Z8)
LU800V1	2.2	5	12	32	—	128x8	Uses RAM area	40DIP 44QFP	For development of SM803 For pilot production

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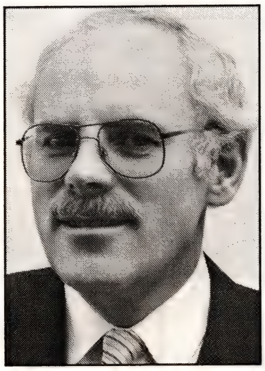
Circle 37 on reader service card

which will total some 1 million lines per year over a five-year period starting in 1987. (L. M. Ericsson will get the remaining 35%.) By 1988, AT&T-Philips's business with the Dutch PTT will run at a rate of $330 million a year.

The company's first significant breakthrough in the European public-switching market nearly came, surprisingly, in France [*Electronics,* Oct. 21, 1985, p. 26]. Usually impenetrable to foreign makers, the French Direction Générale des Télécommunications (DGT) has been looking for a second switch supplier as a matter of policy since the merger two years ago of the public switching divisions of CIT-Alcatel and Thomson-CSF into Alcatel-Thomson. Also, the Compagnie Générale d'Electricité (CGE), Alcatel-Thomson's parent, has been desperately seeking ways of expanding its export activities in public switching.

UP FOR GRABS. To get its competing supplier, the French are putting up for grabs the 15% of their switching market now supplied by the nationalized Compagnie Générale des Constructions Téléphoniques (CGCT), the former ITT Corp. subsidiary that produces Thomson's MT line of switches under license. In return, the DGT wanted a similar foothold for Alcatel-Thomson in a significant foreign market.


TARGETS. Exchange manufacture is a capital-hungry business, says Kutznik.

After several vain attempts to strike an accord with a European partner, the PTT was resigned to teaming up with either a U. S. or a Japanese company. CGE chairman Georges Pebereau hammered out a deal, with the approval of the DGT, whereby the CGCT would produce under license AT&T-Philips's 5ESS-PRX in exchange for AT&T's putting Alcatel-Thomson's E-10S in its catalog in the U. S. The two companies would then cooperate on future developments.

Despite the DGT's sanction, the deal has now been frozen at higher levels in the French Socialist government. "After we nationalized CGCT, which was tantamount to throwing ITT out of French telecommunications, how is it going to look if we give their market share to AT&T—especially when we're always talking about European cooperation?" asks one government official. "The problem is that no matter how long the people at the AT&T and Philips venture tell you they're a European company, you know it isn't true. The creation of that firm marked the exit of Philips from public switching, a business that they were never very successful in anyway."

Still, the official admits that the deal worked out between AT&T and CGE meets all the requirements of an advantageous one for the French. Pebereau has nonetheless been directed by the government to make another attempt at finding a European partner. Failing that, it is not out of the question that the deal with AT&T-Philips could be revived. It is very unlikely, however, that the government would approve such a move until after the French parliamentary elections in March of next year.

TWO STRATEGIES. AT&T-Philips officials realize that in their bidding for business in both Asian and European markets, different marketing strategies will have to be mastered. In Third World countries, says Kutznik, telecommunications is still a commodity business and competition is predominantly on cost per line. AT&T-Philips enjoys economies of scale to compete at that game. This year, for example, AT&T overtook Northern Telecom Ltd. as the world's largest digital-exchange manufacturer. "Even so, we will not sell at any cost," says Kutznik.

Europe, by contrast, is shifting from a commodity- to a service-driven business. Rather than tackle entrenched suppliers head-on, AT&T-Philips is focusing on exchanges with advanced features and products that let PTTs run their networks more efficiently. With modern digital exchanges, says Kutznik, PTTs can provide extra revenue-earning services for only a small additional outlay in advanced software.

The six exchanges provided to British Telecom for its toll-free network are a case in point. Later enhancements will automatically queue calls and divert to alternative lines when a called party is busy. After regular business hours, a company's calls could automatically be diverted to an information center staffed 24 hours a day. "In the States, there are 5 billion calls a year of this nature, and growth is phenomenal," says Kutznik.

Equipment of this kind opens customers' doors. But to be successful, AT&T-Philips realizes, it must eventually become a major supplier of standard exchange gear, and must seize every opportunity as it arises. Kutznik believes that this growth will come by acquisitions and joint ventures. But, cautions Stark, "we will not dilute the intellectual ownership of our partnership."

Right now, he concedes Europe's 12 suppliers look sound enough. The crunch will not really come until "the first quarter's results go down the tubes." ☐

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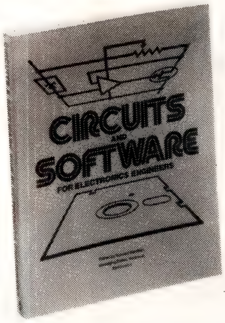

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two parents and will receive $200 million in additional investment funds over four years, largely supplied by the government. The rest will be made up of loans at highly preferential rates.

By any standards, the company's plans are ambitious. It will employ some 700 people and expects to produce its first chip at its factory outside Madrid by the end of 1986, with sales of $200 million by 1987. Sales are projected to rise to between $300 million and $400 million in following years.

What's more, current plans are to export about 85% of the mostly custom circuits produced in AT&T's 1.7-μm CMOS technology. Officials at both the CTNE and the Industry Ministry acknowledge, however, that AT&T will be the venture's biggest customer, at least in the beginning.

The government was also hoping to find a second partner in ICs for Piher SA, a Barcelona maker of discrete components, but it has decided that it would be prudent to delay that part of the plan until the company works its way out of what officials describe as catastrophic financial problems. When that does happen, Britain's Ferranti Electronics Ltd. and France's Thomson-CSF are seen as likely suitors, say Spanish officials.

MAINFRAMES AND PLOTTERS. Under the data-processing provisions of the plan, Hewlett-Packard Co. will produce plotters in Spain, and Fujitsu Ltd. will take a majority share in a joint venture with CTNE to produce mainframes. The Japanese company has only a small share of the venture now, which has made it somewhat reluctant to transfer technology to it. Ing. C. Olivetti & C. SpA and Philips will expand their current operations, while Sony Corp. and Sanyo Electric Co. plan to expand their consumer-electronics operations.

The other principal plank of the national plan was to promote the modernization of Spanish industry by giving tax credits to companies desiring to install or improve their data-processing or office-automation systems, as well as to factories wishing to install more automated systems and robots.

Factory automation is a particular concern because, excluding the automotive sector, fewer than 90 robots had been installed in all of Spanish industry by the beginning of 1984. The government, through its master plan, hopes to increase the robot population tenfold by 1990.

In addition to the attention that foreign multinationals are getting in Spain, small companies are beginning to get into the act as well. Helping them along is a growing number of venture capital organizations, typical of which is the Sociedad Bancaya de Promoción Empresarial (SBPE), a subsidiary of the Grupo Banco de Vizcaya.

SBPE has already invested some $10 million in a total of 40 venture-capital projects, with the lion's share in electronics. In addition, it has another $50 million free for funding. Director Eduardo Rodriguez Legórburu points out that his company was Spain's first venture-capital bank that was modeled after U. S. organizations. He says he expects to see more cropping up soon.

High customs tariffs kept foreign electronics firms away

One small Spanish company already making its mark is Eurohard SA, which cashed in on the misfortunes of a British counterpart. President Eduardo Merigó explains that Eurohard had negotiated a licensing agreement with Dragon Computer to produce that company's home and educational computers when Dragon went into receivership. Eurohard then had little choice but to purchase the company, and it is now producing a line of four 8-bit computers based on the Motorola 6809 microprocessor at a factory in Cáceres, near the Portuguese border.

Eurohard's first moves were to change the read-only memory of the British machine to include all the Spanish characters and to create a large library of Spanish software. It has since developed several new models, one with expanded memory and the other using the Japanese MSX operating-system standard. Its first marketing success came in the educational market.

"We were chosen by the Spanish confederation of private schools to supply 4,000 computers for 300 schools. And if you know how many Catholic schools there are in Spain, you know what a breakthrough that is," says Merigó.

Additional orders from those private schools should mean an increase in sales for the company from 15,000 computers last year to some 25,000 this year.

For the moment, Eurohard is enjoying the luxury of having virtually the entire Spanish market for microcomputers to itself. It will soon run into competition, however, from Sinclair Research Ltd., which will begin assembling several of its computer models in Spain next year.

One reason that Spain's domestic consumption of electronic gear is so low is that the country had an exclusion policy. Past governments used high customs tariffs to keep foreign suppliers out of the market unless they were prepared to meet domestic demand with products featuring some Spanish involvement in the manufacturing.

In consumer electronics, companies such as Sanyo and Sony are meeting that government requirement by assembling high-fidelity audio equipment and video cassette recorders at their plants near Barcelona. Sony also assembles Trinitron TV sets, while Sanyo managing director Esteban Borrel claims that his company has "assimilated" the Japanese parent's TV technology and is now producing sets in Spain with well over half the content coming from Europe. Last year, Sanyo España exported 80,000 TV sets to distributors in West Germany for sale throughout the European market.

But trading in Spain will open the possibility of attacking the entire European market from a comfortable base for foreign companies established there, on the condition that they can find a way around two potential snags. For one, though Spain joins the EC on Jan. 1, 1986, tariff barriers between it and the other Common Market members will be dismantled gradually during a period of seven years.

There is another problem: in order to qualify as native EC products for export, equipment produced in Spain must contain at least 50% European value added—a fact that will pose particular problems for some classes of equipment. For example, the VCRs produced by Sanyo and Sony are unlikely to reach that level because the essential mechanical drum mechanism cannot be purchased in Europe—and the European market, according to Sanyo's Borrel, does not justify the investment required to produce it. ☐

PROSPERING. Eurohard SA will supply Spanish-made computers to schools, says president Eduardo Merigó.

or discrete—as long as the signal's dc path goes through the filter. The dc offset of a switched-capacitor filter can be as high as several hundred millivolts, mainly because the MOS switches inject a charge into the integrator capacitors. There is an additional contribution from the dc offset of the internal CMOS operational amplifiers in the filter circuit.

Wideband noise has been just as big a problem. In a switched-capacitor filter, even though charge values are kept low to allow integration of complex filters with a reasonable die size, a switched capacitor nonetheless is configured to approximate a large integrator resistor, which is inherently very noisy. For example, a 1-pF capacitor driven by a 100-kHz clock approximates a 10-MΩ resistor. And because a typical monolithic filter has from 4 to 20 such high-value switched-capacitor integrators, the wideband noise that results can range from a several hundred microvolts to as much as 1 mV rms.

As a first step in dealing with these problems, Linear Technology designers evolved a silicon-gate CMOS process optimized for fabricating monolithic filters, according to Robert Dobkin, vice president of engineering. The technique is an alternative to present single-polysilicon-layer metal-gate or double-poly-gate techniques.

Capacitors formed with metal gates can be extremely linear with a low temperature coefficient because of their basic geometry. But although this structure has the plus of excellent accuracy, its diffused bottom plate exhibits junction leakage. Furthermore, the associated parasitic junction capacitance also slightly degrades speed.

ADDING A MASKING STEP

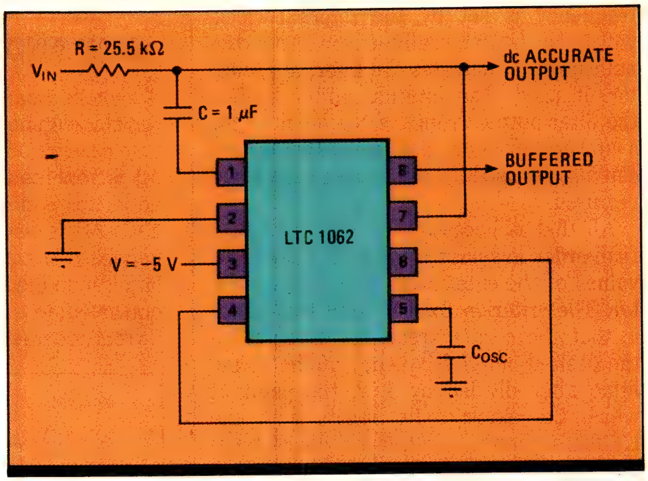
Many manufacturers have moved to silicon-gate CMOS because it offers a number of advantages over metal-gate CMOS, including stable offset voltages, gate-drain capacitances that are seven times lower, and bandwidths that are two to three times greater. As a result, charge injection can be limited to no more than a few tens of millivolts versus a few hundred millivolts for the metal-gate process. However, a single-poly-layer capacitor is not so easy to achieve with silicon gates as it is with metal gates. With a single-polysilicon layer, the diffused bottom plate cannot be fabricated because the polysilicon acts as a mask for the source and drain diffusions used in forming the bottom plate. To rectify this, many designers have resorted to forming the capacitor between two poly levels, with the bottom-plate oxide isolated. Because this process is more exotic and difficult, it adds to the cost of producing the wafer.

The Linear Technology process (Fig. 3) adds a masking step to the single-poly layer and then implants a rich diffusion. This process yields a structure remarkably similar to that of a metal-gate capacitor; the difference is that instead of an aluminum top plate, there is a polysilicon top plate. Used in a family of monolithic universal filter building blocks implemented with traditional active-filter-design techniques—the LTC 1059/60/61—the result is performance that borders on that possible with discrete active RC filter configurations—an 85-dB dynamic range, a center frequency of up to 30 kHz (instead of 20 kHz), and a center-frequency-times-Q product of 600 kHz (instead of 100 kHz).

The key to the new circuits is an external feedback loop

Though such process improvements enabled designers to reduce the critical parameters by a significant amount—offsets down to 15 to 40 mV maximum on the LTC1060, for example—what Dobkin and his designers were looking for was little or no dc offset and noise at least an order of magnitude lower to below 100 µV rms.

The problem is that this is virtually impossible with present approaches to filter design, says Sevastopoulos. "No matter how sophisticated the processes, how finely tuned the manufacturing, and how expertly done the circuitry, filters based on switched capacitors always contribute noise and distort the dc signals. What was required was turning traditional concepts of how to implement monolithic active filters upside down, approaching the problem from an entirely different point of view."



2. ISOLATION. Two external capacitors and a resistor isolate the LTC1062 from the input-signal dc path.

The traditional approach to solving a signal-filtering problem, he says, is to choose from among the many classical mathematical filtering algorithms—such as Chebyshev, Butterworth, and so on—the one that best fills the needs of the design. Then the designers have to deal with the various side effects, such as offsets and noise, the best they can, through process improvements and various circuit tricks.

What Sevastopoulos has done is to develop an external circuit configuration that achieves the dc and ac performance wanted (no dc offset and noise in the microvolt range) and then designed a nontraditional filtering algorithm. In combination with the external circuitry, this approach results in the specific classical function they want to perform.

The key to Linear Technology's new circuit configuration is the use of an external feedback loop, which takes the output and feeds it into an input-buffer op amp contained on the LTC1062. The input-buffer op amp monitors the output of the overall filter and presents a frequency-dependent impedance to the bottom plate of the external capacitor. This turns the simple external RC configuration into a fifth-order low-pass filter, instead of a first-order filter that the external RC circuit would have provided. Because the input and output are taken simultaneously across the external resistor at dc voltage levels, the active part of the circuit is removed from the input-signal dc path. This preserves dc accuracy. As the frequency of the input signal increases, the external capacitor gradually places the active circuitry on the LTC1062 into the ac path to filter the signal. Not only does the external RC circuit isolate the LTC1062 from the dc signal path, says Sevastopoulos, but it also determines in part the filter's ac performance.

But to make this approach work required the development of a nontraditional application-specific filter algorithm that would allow the LTC1062, in combination with the external RC circuit, to form an overall low-pass filter approximating a Butterworth polynomial characteristic.

In the Linear Technology approach, this nontraditional algorithm is realized on the LTC1062 in a filter network consisting of 5 op amps, 12 capacitors, and 40 switches. A sixth op amp works as an internal buffer. Also contained on the 100-by-100-mil chip is an internal oscillator and clock. The filter cutoff

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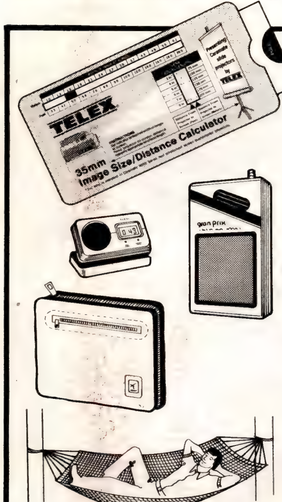

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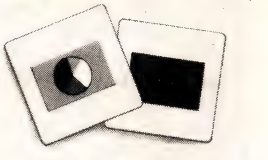

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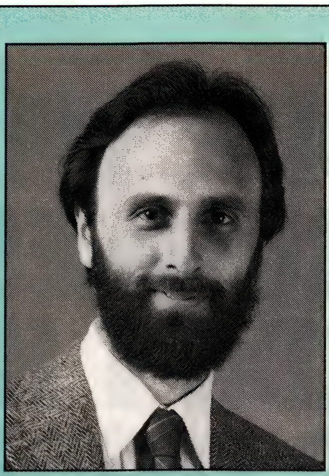
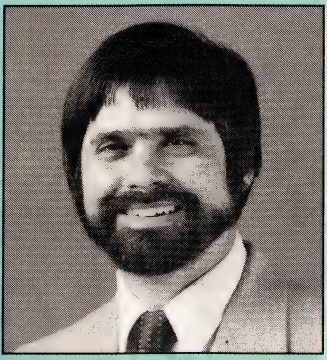
sired result, are not necessarily good ones. They are simple-minded programs—the simplest and crudest way to get the data. This approach by itself tends to be very inefficient. Although it appears to be an expert, the program synthesizer neither knows nor applies the tricks and expertise for writing the most efficient query programs that a real DBMS expert could. This is where the second, and very intelligent, part of the process comes in.

Machine reasoning takes the straightforward, simple-minded query program and turns it into one that is fast and efficient in its use of computer resources. This heuristic query-optimization operation uses a technique known as goal-directed problem reduction. This technique resembles the one used in the better chess-playing programs. Analogous to chess-playing, the machine-reasoning step pits Paradox, the problem solver, against its opponent, the complexity of the problem or query submitted by the user. The goal is to find the best query program to get the user's answers as quickly and efficiently as possible.

The intelligent problem-solver in Paradox looks for opportunities to manipulate data efficiently. For example, it decides which keys would help and creates them on the fly. It may evaluate whether it pays to create a temporary index at a certain point or, if there already is an index, determine if it is useful here. The machine-reasoning program develops a bunch of alternative moves. Then it analyzes these moves, putting a weighting factor on each one that represents judgment by the program about the probable level of efficiency of that particular alternative.


CODEVELOPERS. Richard L. Schwartz wanted Paradox to be comprehensive but easy to use . . .


. . . and Robert E. Shostak was influenced by VisiCalc in designing the Ansa Software system.

The program then selects what seems the best alternative move and the data-query crunching begins. The reasoning program looks at intermediate results at every place where a choice can be made. At these decision points, the program decides again which branch looks best. This is a heuristic choice process because it can store information from a previous query and use it again to make a better choice this time.

MODIFYING ON THE FLY

All this thinking occurs dynamically. The reasoning program takes one step of the process at a time and is free to modify its strategy at each step if an improvement in efficiency is discovered. This approach is even better than having a DBMS query expert write a program because the expert cannot change his strategy once the program is written. But the dynamic expert in Paradox keeps changing strategy to suit the current conditions and information available. This results in a performance advantage over the best query-language experts. The ultimate result is a data-management system for personal computers that is lightning fast. Not only is it fast, but it is remarkably easy to use.

The way that AI machine reasoning is brought into Paradox is different from the way that expert systems are used. In Paradox, machine reasoning simplifies the process the user performs. The user does not interact with a knowledge base through an inference engine, as he would with an expert system. Further, the user is not aware of the reasoning process and sees no evidence of it when using Paradox. The only evidence that machine reasoning has been busy behind the scenes is the speed with which the answer is returned.

The developers first came up with the ideas for using a query-by-example approach and the hiding of complexity and then found that artificial-intelligence techniques would help them to achieve their goals. They did not start with the idea of building a data-base-management system using AI. The overriding goal was to hide the complexity of high-level data-base management from the user. When the developers finished applying AI technology to the query-by-example concept, they found that they had hidden most of the complex database concepts.

Paradox's internal query language is both an extension and a simplification of IBM's QBE concepts. For example, the Paradox query language uses explicit joins (the joining of two tables or relations) and summary information. Other improvements over IBM's QBE simplify the information the user has to provide. Paradox keeps the number of basic concepts very low. These few primitives are the basis of all interaction between the user and Paradox.

Starting with their original concept for an impromptu query tool, Schwartz and Shostak soon discovered that user requirements got a bit more stringent. Eventually, over the course of the four years of development, they found it necessary to add report generation, validity checking, a Lotus 1-2-3-like menu, a programming language, and a form designer. But one of the elegant things about Paradox is that these additional complexities can be hidden until the user needs them. And he can learn to use them one at a time, a little at a time. The beginner can start quickly by learning just the simple menu manipulation of four basic aspects: tables, forms, queries, and reports.

Ansa borrowed the menu mechanism from 1-2-3 for two reasons: not only is it easy to learn and use, but many personal computer users—target customers for Paradox—are familiar with it. The designers borrowed another 1-2-3 concept—the notion of a macro.

Macros, in essence, capture a user's sequence of commands and queries for reuse later. It is like turning on a recorder and putting the results away to use again and again without rethinking and retyping the operation. Macros get Paradox users started in programming in as painless a manner as possible—often before they realize that they are programming. Users begin using macros to write simple scripts for their often-repeated operations.

If Paradox users want to graduate to programs more complex than macros, then the system provides a programming language. The Paradox programming language borrows its elegant style from the C language. Users can build programs with this language because it includes structures for array handling, simple procedures, and procedures with input parameters. The language also contains a rich set of financial, mathematical, string, and logical functions.

The programming language is powerful and rich enough to provide value-added resellers with an environment for building quick prototypes of applications and for developing complete applications. VARs can even encrypt their scripts and macros and deliver them as products that cannot be stolen and copied. The end users of these VAR applications do not even need to know they are using Paradox because it can be bundled into the VAR's application product. ☐

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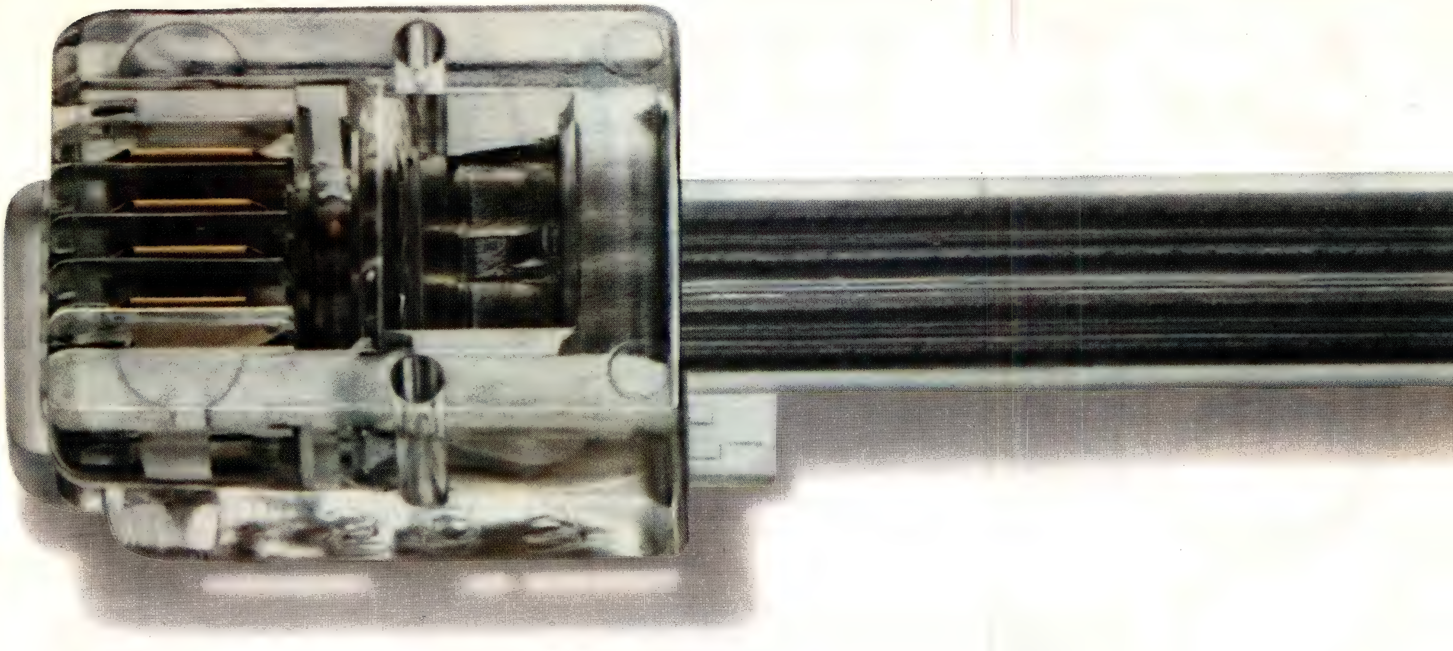

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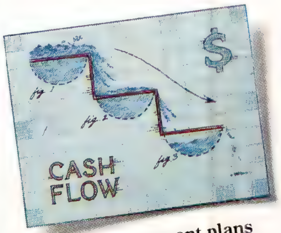

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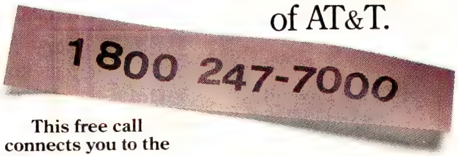

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selling for less than $100,000, robot experts say.

Experimental manipulators such as the University of Utah-Massachusetts Institute of Technology hand, which has the sensitivity to pick up an egg and crack it precisely against the side of a bowl without spilling, already are beginning to achieve the necessary precision to tie individual strands of wire to their connectors. But the challenge for researchers, and the venture capitalists who support them, is to come up with a manipulator that can work in an industrial environment, where delicacy must necessarily be combined with ruggedness.

Heavy industrial manufacture is almost synonymous with ruggedness. When companies such as General Electric Co. or General Motors Corp. call one of their assembly lines "automated," it usually means that large parts are moved from place to place by automated guided vehicles and palletizing robots. If the parts themselves require such work as welding or spray painting, robots are employed under the direction of human inspectors; delicate sensors such as vision systems are rare in an environment where noise, vibration, and uneven light are the norm.

Skilled human workers are required to assemble the more complex and valuable components of most manufactured products; robots can do only the simple jobs. In GE's automated dishwasher factory in Lexington, Ky., for example, washer blades are machined robotically under the direction of programmable-logic controllers, but the dishwasher's electronics must be installed by hand.

Similarly, in GM's automated Buick-Oldsmobile-Cadillac plant in Flint, Mich., robots dominate only in heavy-material transport—in the form of automated guided vehicles supplied by Sweden's Volvo AB—and in repetitive jobs such as spot welding. Automated component assembly (usually done outside the plant) is very limited because the current robot generation lacks the visual and tactile sensors necessary to perform delicate tasks with precision.

Robot makers are out to change this situation and second-generation robots are beginning to incorporate sophisticated sensors and high-precision servo motors [*Electronics,* Oct. 7, 1985, p. 18]. The result is improved coordination, permitting the simultaneous use of two robot arms for a single task. Fujitsu Ltd.'s new Farot M6 robot, for example, offers two-arm synchronization with a 0.03-mm positioning accuracy. Sensors in the joints govern motional increments from 10 to 20 μm—adequate for the assembly of delicate automobile components such as ceramic substrates and wire-junction switches.

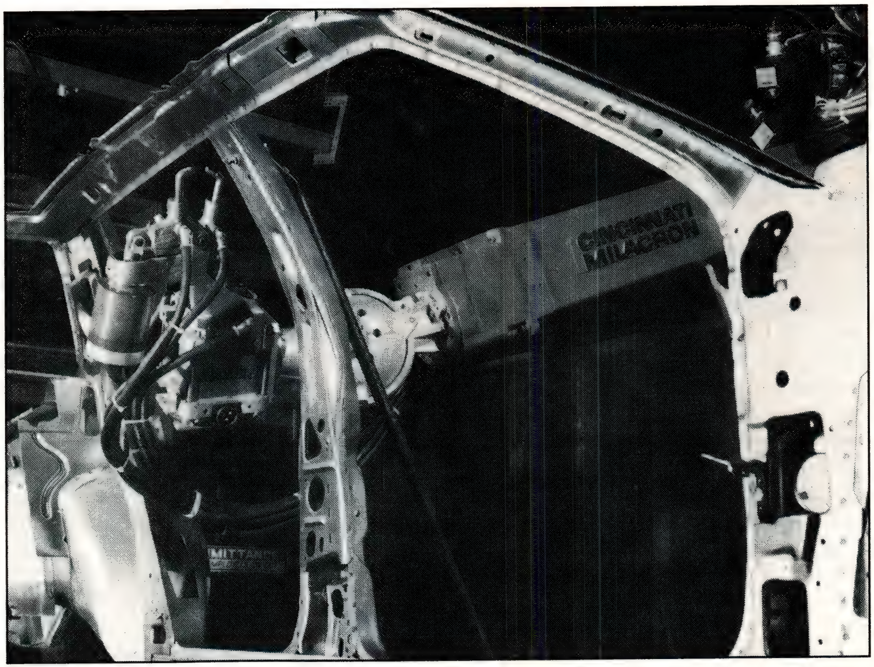
At present, the M6 operates only in Fujitsu's own plants, assembling parts for internal use and for such Japanese industrial giants as Toyota Motor Co. and Nissan Motor Co. In general, however, automated component assembly is significant only in printed-circuit-board assembly for the electronics industry. Heavy industry still relies on parts made by nonautomated equipment.

Automation is now penetrating an important niche in heavy-industrial assembly, however, in the machine-vision inspection of simple parts. GM has finally signed an agreement—in the works for over a year—with Automatix Inc. to support the Billerica, Mass., vision company's efforts to develop inspection capability for a wider range of automotive components. The goal is to expand current technology, which can inspect only parts with relatively simple contours, such as speedometers or chip pinholes on pc boards. Inspection and testing of larger and more complex objects—such as automobile bodies—requires much more advanced object-recognition capability. Hence the task still must be performed by human inspectors, not machines.

But as Richard Beecher, manager of robotics and assembly at the GM Technology Center in Warren, Mich., points out, the very inflexibility of current-generation vision equipment helps to ensure product quality. "Robot inspection systems are less tolerant of defects than human beings are because they won't even recognize an object if something minor is out of place."

A related aspect of quality control is minimizing product variance by high-precision parts machining. New developments in programmable-controller software allow the manufacturer to more precisely specify the dimensions of a given part. Improved software also permits a broader use for numerical controllers, which can be reprogrammed to respond to changes in design instructions almost as soon as they are handed down [*ElectronicsWeek,* May 6, 1985, p. 30].

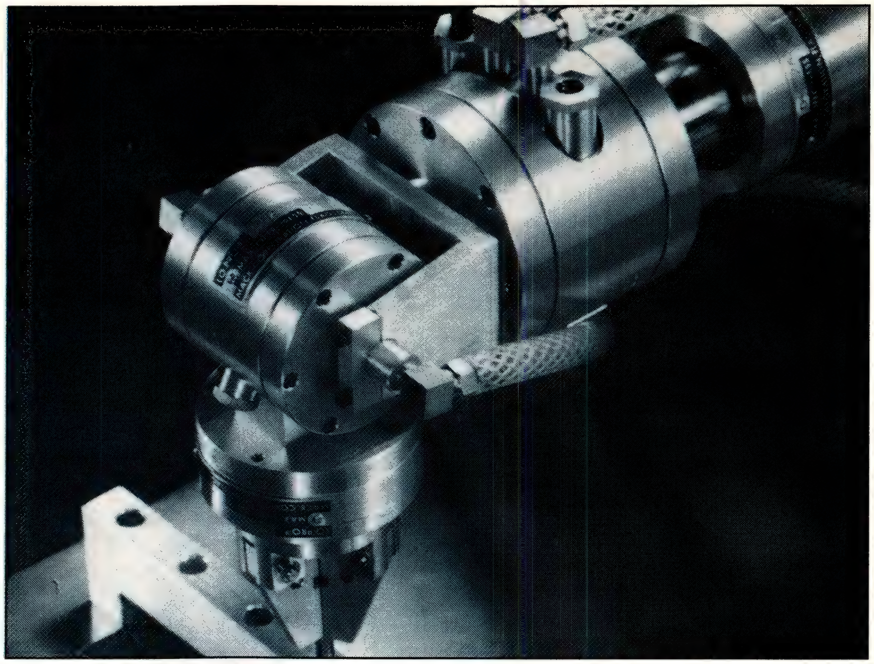
Illustrating the trend toward software-driven programmable controllers is the 6120 industrial computer system from Allen-Bradley Co., Milwaukee, and the UDC 5000 (for universal digital controller) from Honeywell Inc., Minneapolis. Both controllers offer to machine-tool users in heavy industry the same process-control software now at work in electric power plants and petroleum refineries, with little modification required on the customer's part. So far, with some success: GE's locomotive works in Erie, Penn., is now configured around flexible work cells that can quickly machine a wide variety of parts with substantially improved precision using controllers from Allen-Bradley and Honeywell.



ON THE SPOT. Robots in heavy industry are mostly used for spot welding and spray painting. Flexible end-effectors permit operation behind the plane of the robot's arm.

"There are a lot of success stories in industrial automation," says Beecher. "But you'd be surprised at how few are actually at work in assembly today. The new GM-Toyota plant [United Motors Corp. in Fremont, Calif.] is not automated to any great extent, and very few of the Japanese auto plants are more automated than we are."

This is not to say that manufacturers are reluctant to sink their research and development resources into automation. On the contrary, GM expects to employ some 14,000 robots by 1990, up from about 5,400 today. Assembly robots, however, number only about 500 at GM; the rest are used for parts



SENSORS WANTED. Robots without sensors are restricted to simple, repetitive jobs in assembly. Still missing from most robots now in operation are the tactile and vision systems that would give them greater precision and permit their use in more complex tasks.

mum of effort by automatically tracking inventory adjustments, cycle counts, parts transfers, scrap, job numbers, and setup times. The same software can now be used by the factory's management to schedule orders based on projected market demands.

Ultimately, the goal of factory automation is to tie a number of different systems, or islands of automation, into a single manufacturing process. GM, by promoting its Manufacturing Automation Protocol, has taken a step in that direction, but MAP is not a standard that every automation vendor can simply adopt to run machines according to one set of computerized instructions.

“MAP is not a single operating system,” stresses Andy McMillan, manager of Network Evaluation and Communications at the Industrial Technology Institute in Ann Arbor, Mich. “Rather, it specifies which standards vendors can use to let their machines exchange information with machines from other suppliers.”

GM has virtually promised its outside suppliers a $40 billion market from GM alone if they will manufacture their equipment according to MAP specifications. Compliance with MAP means that machine tools, robots, and programmable controllers must be able to communicate with each other (and with supervisory computers) through an IEEE-802.4 token-passing protocol linked with an Ethernet broadband local-area network. Data transmission occurs at 10 Mb/s—adequate both for real-time control at the machine-tool level and for detailed data collection at the supervisory level.

But MAP will be implemented slowly, and the achievement of true integrated manufacturing is not likely before the end of the decade. At present, no networked setup, whereby production robots or numerical controllers can exchange data with the computers that process design instructions and parts lists, is yet in operation, though GM will show a prototype MAP network at November's Autofact in Detroit.

“Today's systems are too complex for a single integration protocol,” says Dennis Lockhart, project manager for factory-automation systems at Universal Instruments Corp., Binghamton, N. Y. “But integrating them won't work in a piecemeal approach, either.”

Universal, like all automation-equipment vendors, recognizes the need for an integrated networking protocol for automated work cells. It is not, however, ramping up to participate in MAP with the same vigor as such other automation heavyweights as Siemens, Honeywell, and Control Data.

Universal also looks askance at inventory-control protocols such as MRP II that purport to offer a generalized solution to automated materials handling. End-user requirements are “just too varied for a standard protocol, and at least for now, we think we're best off devising the integration of our own equipment around the specific task the customer wants done,” says Lockhart.

The upshot, even for MAP participants, is a need to promote the uniformity of data-transfer and robot-control standards for different levels of automation. Toward that end, the Industrial Technology Institute has established the first test facility to offer independent conformance testing for MAP products—in much the same way that Underwriters Laboratory certifies consumer products. ☐

Additional reporting was supplied by Michael Berger

NEW TECHNOLOGY SURGES FROM MAKERS OF PROCESSING EQUIPMENT

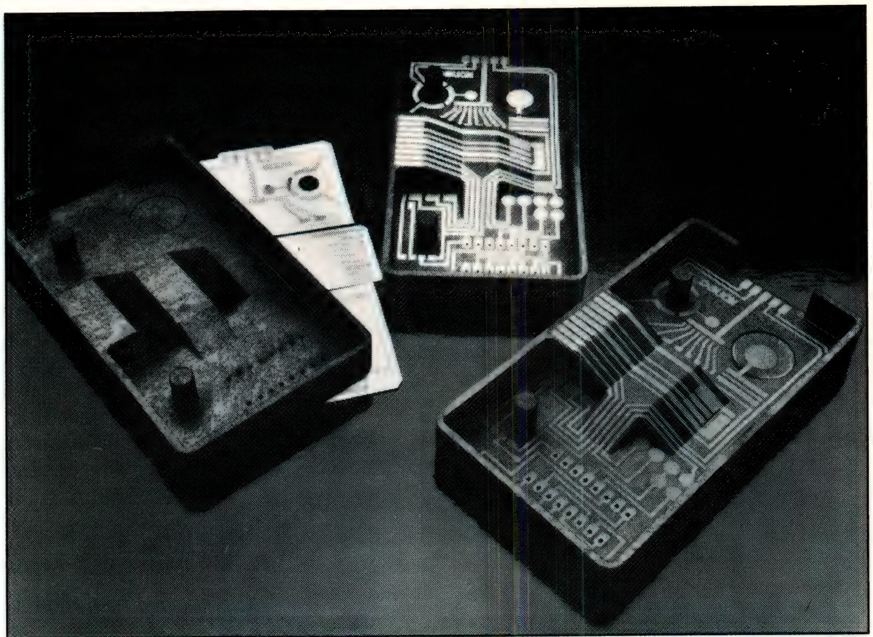
by Jerry Lyman

Manufacturers of chip-processing equipment are bucking the severe recession in the electronics industry and continuing to pour resources into advancing the state of their art. Their aim: to help semiconductor manufacturers achieve even finer line widths with higher yields, better reliability, and faster throughput—all at lower cost. Their efforts are paying off with the introduction this year of some outstanding new processing equipment, including the first machines that accommodate 8-in. wafers, and some key developments in the extremely promising field of X-ray lithography.

In printed-circuit boards, molded thermoplastic-board processing continues to diversify, with several new and potentially cost-effective fabrication methods beginning to appear. More and more component manufacturers are joining the move to surface mounting and making available surface-mounting versions of their active and passive products. And a new laser-based inspection and soldering machine could solve the technology's tough assembly problems.

As players in the integrated-circuit industry get deeper into very large-scale integration, producing ever-larger chips with ever-higher densities, suppliers of IC-processing equipment are responding by bringing on a new generation of machines. Three innovative representatives of this trend are a new type of chemical-vapor-deposition (CVD) system, a radically different ion implanter, and a novel laser-scanned reticle generator.

Anicon Inc.'s CVD system can be tailored for use with oxides, polysilicon, tungsten, and high-temperature nitride. The Anicon machine features an isothermal design—essentially two quartz bell jars surrounded by a uniform heating system. Reactive gases enter the system at the top of the chamber and are funneled over a batch of up to 200 wafers.



ADDITIVE TRANSFER. Union-Carbide and Chomerics teamed to develop the Konec process, in which molded Radel resin substrates (left) are overlaid with a circuit-pattern transfer (back). Finished boards (right) can get an extra nickel-plating layer (center).

commercial X-ray steppers suitable for production use.

Boards molded of the so-called engineering thermoplastics—polysulfone (Udel), polyetherimide (Ultem), and polyethersulfone (Victrex)—look like attractive alternatives to garden-variety epoxy-glass types. All three have higher operating temperatures than epoxy-glass, can be molded in three-dimensional shapes, have relatively low dielectric constants, and could compete in price with the popular pc-board laminate when produced in large quantities.

Before this year, most plating on thermoplastic boards used some form of additive or semiadditive process. One of the techniques used previously is the fully additive, resistless Photoformation process, developed by Kollmorgen Corp.'s PCK Technology Division in Melville, N. Y., which is particularly suited to nonplanar surfaces.

In 1985, a giant multinational chemical concern that manufactures resins for Victrex and other thermoplastics decided to go into the plastic pc-board business. ICI Americas Inc. opened a facility in Newark, Del., to turn out 3-d molded circuit boards on injection-molded Victrex. ICI is licensed by PCK to use the Photoformation process for plating the molded boards. ICI seems to have started a trend wherein large plastics manufacturers get involved in the plastic-board business. For example, Union Carbide Corp. and General Electric Co.'s Plastic Operations, both manufacturers of resins for thermoplastics, have each collaborated with pc-board companies in developing new methods for plating plastic boards.

Union Carbide's Special Polymers and Composite Division, Danbury, Conn., and Chomerics Inc., Woburn, Mass., teamed up to develop a completely new method of putting printed wiring on nonplanar thermoplastic boards. The new process,

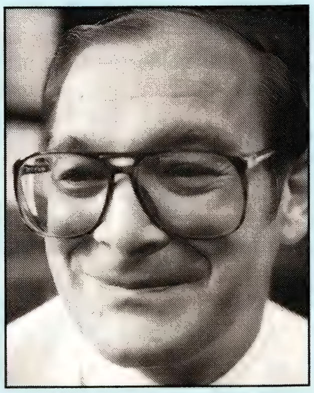
ENGLEMEIER: 'MIL SPECS DRIVE PEOPLE IN THE WRONG DIRECTION'

by Tobias Naegele

To interconnection expert Werner Englemeier, military test standards and procedures are aggravating an already bad situation. Interconnection technology, which he calls "the bottleneck of the electronics industry," is where the micro world of computer chips meets the macro world of packaging.

Military specifications have had a severe negative effect in this area, according to Englemeier. The 46-year-old Austrian expatriate, a researcher at AT&T Bell Laboratories Interconnection Technology Group in Whippany, N. J., is a major figure in what could be the most volatile and most unexplored area of the electronic frontier. With 15 years of experience with interconnection technology, Englemeier has spent the last five years studying testing techniques for surface-mounted-device carriers. He is a member of an Institute of Electrical and Electronics Engineers task force on the topic, a group that is supported by 23 companies including AT&T, IBM, and Texas Instruments. And he is an outspoken critic of military standards and test procedures.

"Military specifications are irrelevant to the commercial world—and in many cases, the military world as well," says Englemeier. "The testing they do for military specs is not appropriate for most applications. For airplanes, maybe, but most machines do not have to endure such extreme conditions."



WERNER ENGLEMEIER

In his area of expertise, chip carriers and printed-circuit boards must be highly compatible to avoid failure. "Mil specs are driving people in the wrong directions," he explains. "It encourages vendors to match the expansion coefficient of a chip carrier to that of a pc board, when in fact they don't want to do that. You want to match the product of the expansion coefficient and the temperature excursion."

Generally, chip carriers are tested using thermal-shock techniques, where the carriers are heated to extreme temperatures and cooled rapidly. Englemeier, who holds a masters degree in mechanical engineering from the Massachusetts Institute of Technology, maintains that such testing is pointless, because with the exception of fighter jets such extreme and rapid changes in temperature do not occur in most natural environments. Instead, he believes a power cycling test is more valuable, because it simulates the factor that causes the greatest strain on semiconductor devices and carriers—power-on and -off.

"What I advocate is that in order to get a complete picture you need a close simulation of the real field conditions," Englemeier says. To do that, he built a test station to simulate the mainframe environment: the 75°C operating temperature and the 200-ft/s air speed caused by cooling fans.

Using this technique, he can determine the components' mean rate of failure resulting from fatigue, an important figure. "Thermal-shock environments give you failures due to overstress and not due to fatigue. It's a totally extraneous failure mechanism."

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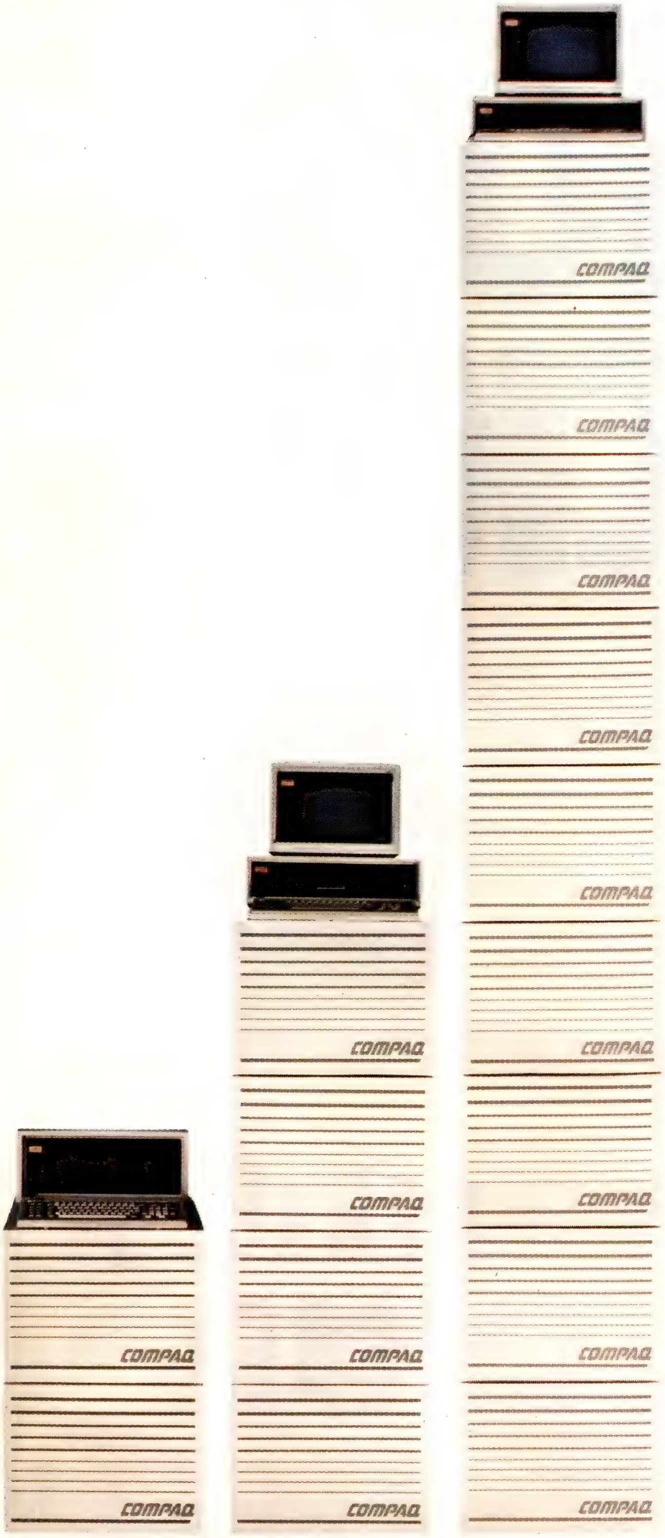

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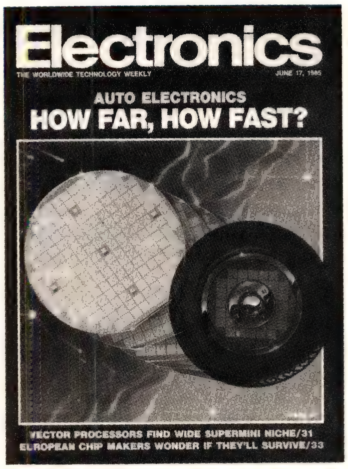
Starting with the June 17th issue, our name, Electronics, is back.

Larry Altman and Bob Henkel are back, too. They were both editors at Electronics in the 60's and 70's, a part of the team that published the most authoritative magazine in the field. They both went on to distinguished publishing careers elsewhere. Now, Larry is Publisher and Bob, Editor-in-Chief of Electronics. Together with the entire team to bring back the tradition that made Electronics the leading publication in the electronics industry.



Electronics

THE WORLDWIDE TECHNOLOGY WEEKLY

JUNE 17, 1985

AUTO ELECTRONICS

HOW FAR, HOW FAST?

VECTOR PROCESSORS FIND WIDE SUPERMINI NICHE/31

EUROPEAN CHIP MAKERS WONDER IF THEY'LL SURVIVE/33

ELECTRONICS, EVERY WEEK

OCTOBER 28, 1985

PRODUCTS NEWSLETTER

PHILIPS, SIGNETICS TO BRING OUT ENHANCED 68000-COMPATIBLE CPU

Look for Philips and Signetics Corp., its U. S. subsidiary, to introduce this week a jointly developed 68000-compatible controller chip loaded with enhancements. Dubbed the 68070, the chip includes a memory-management unit, direct memory access, a universal asynchronous receiver/transmitter, and three timers. Samples will be available in mid-1986 in the $85 to $100 range. When the chip enters production in late 1986, its price should be below $25. The chip also is compatible with the I^{2}C (inter-integrated circuit) bus developed by Philips. Fabricated with a 2-μm CMOS process in an 84-pin plastic leaded chip carrier, the 68070 features a 16-bit data bus and can address up to 16-megabytes. Simultaneously, the companies will introduce a peripheral chip, the 68905 cache memory-access controller. ☐

CONTROLLER SPEEDS STEPPER MOTOR

Design engineers working with stepper motors can now use up to 95% of a motor's available torque to increase speed, making it possible to use a smaller motor for the same application. Design Components Inc.'s single-axis control module employs parabolic ramping to produce speeds of 20,000 steps/s, twice those of conventional linear and exponential techniques. The Franklin, Mass., company's controller sells for about $2,000 and fills the gap between steppers and servos costing four times as much as the steppers. The package includes a controller, motors, and a power supply. ☐

GRAPHIC SOFTWARE SYSTEMS OFFERS IMPROVED INTERFACE

Graphic Software Systems Inc.'s new interface for raster and vector graphics offers performance roughly 10 times faster than the company's current package. The GSS*CGI package implements the emerging ANSI computer-graphics-interface, or virtual-device-interface, standard. Its logical-to-physical mapping for graphics screens effectively separates applications from their hardware. Aimed at desktop publishing and computer-aided-design uses, the software runs on IBM Corp. Personal Computers and PC-compatible machines and sells for $175 per copy. ☐

CMOS CLOCK CHIP CUTS Z80-BASED SYSTEMS' POWER USE

A CMOS clock generator/controller chip from Toshiba America Inc. can cut the power consumption of Zilog Inc.'s CMOS Z80 microprocessor. The Tustin, Calif., company's T6497 puts the CPU and peripheral chips into one of three power-saving modes when the CPU stops executing a program. In the run mode, the clock and oscillator continue running; in the idle mode, the oscillator is active but the clock does not send a signal; in the stop mode, the clock and oscillator stop, putting the CPU and peripheral devices on standby power. The part sells for $1.60 apiece in lots of 100. ☐

ANALYZERS CAN COVER 90% OF A MICROPROCESSOR DESIGNER'S NEEDS

A new three-model series of logic analyzers can cover 90% of a microprocessor-system designer's testing and troubleshooting needs—everything except exotic research and development functions, claims Arium Corp. The Anaheim, Calif., instrument company says all three of the ML4100 series analyzers operate at up to 100 MHz and have fully coordinated display formats. This permits users to switch between timing, state, and disassembly modes while maintaining the same position in the data buffer relative to the trigger event. The basic system sells for $2,995. The fully configured high-end unit, which supports most 16-bit microprocessors, goes for $5,850. ☐

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Electronics is back—with the industry's top reporting on international electronic technology. In the first half of 1985 alone, Electronics—with its worldwide bureau of correspondents—published more than 140 articles on international technology. Important articles with news and analysis that leaders in the field can't afford to be without, such as:

January

- Philips Uses MBE for Lasers
- Siemens Readies Commercial ISDN
- Japanese Chemical Firm Moves from Soap to Floppies
- Italian Firm Seeks Allies to Crack U.S.
- Japan Pursues Role in Space
- Bellman Switches on Italtel for Expansion
- Robots get Smart in Japan
- ITT Invests in European Units Crack U.S.

February

- Europe's Esprit Finally Sets Sail
- LSI Logic Counts on Sandfort to make its Mark in Europe
- Upstart Vendor Makes Waves in Japan's Robot Market
- NEC Fashions New Fab Process
- Olivetti's Viti Directs ET Designs that Marry Bus & Art
- German Startup's Success Surprises Europeans
- Britons Seek Tolerant Chips
- OBI Rains on IBM's Parade
- Mega's Friedrich Aims to Cut Asian Lead in Memories

March

- British GaAs Chips Go to Market
- NEC's CPU Leapfrogs IBM
- Hitachi CPU Challenges IBM
- France's Lansat Rival Set for Fall Launch
- Olivetti Stakes Claim in Video Typewriters
- Italian VLSI Chip has the Right Accent
- Koreans Try for VCR Replay
- Germans Push X-ray Exposure
- There's Life in Resistors, German Company Finds
- UK Beats a Path for Europe's Race

April

- German System Meets New ICAO Standard
- West Germans Squabble Over Choice of IFF
- Britain Promotes Open Architecture
- US Makes Progress in Japan Telecom Talks
- Japan's Lead in Optical Disks: It's Part of the System
- Daisenberger Guides US Firms through Red Tape
- Asia: It's No Longer Just Japan That Threatens US Markets
- Malaysia: Top Shipper of Discretes
- Indonesia: Domestic Sales are the Lure

May

- Thomson's VCR System Clears Up Doubts
- ICL Banks on Networks and Japanese Chips
- Min Blazes Bright Path for Korea's Gold Star
- Asia: The Four Dragons Rush to Play Catch-up Game
- Singapore Casts Lot with Software
- Philips' Eurom Chip Finally Debuts
- Sagging Prices Sting Japanese Producers
- British Telecom Spreads Its Wings with Mitel
- South Korean IC Maker Seeks World Markets

June

- Plessey Switches Off Flash ADC, Saves Power
- Sony Campaigns Hard for BMM Camcorders
- Japanese Quit on IBM Software, Turn to UNIX
- Apple Tries Again to Blast Off in Japan
- Has the End Come for European Chip Makers?
- SIA Protest May Not Stem Trade Tide
- Now It's Korea's Turn in the Robot Market

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Fujitsu's new keyboards for personal computers

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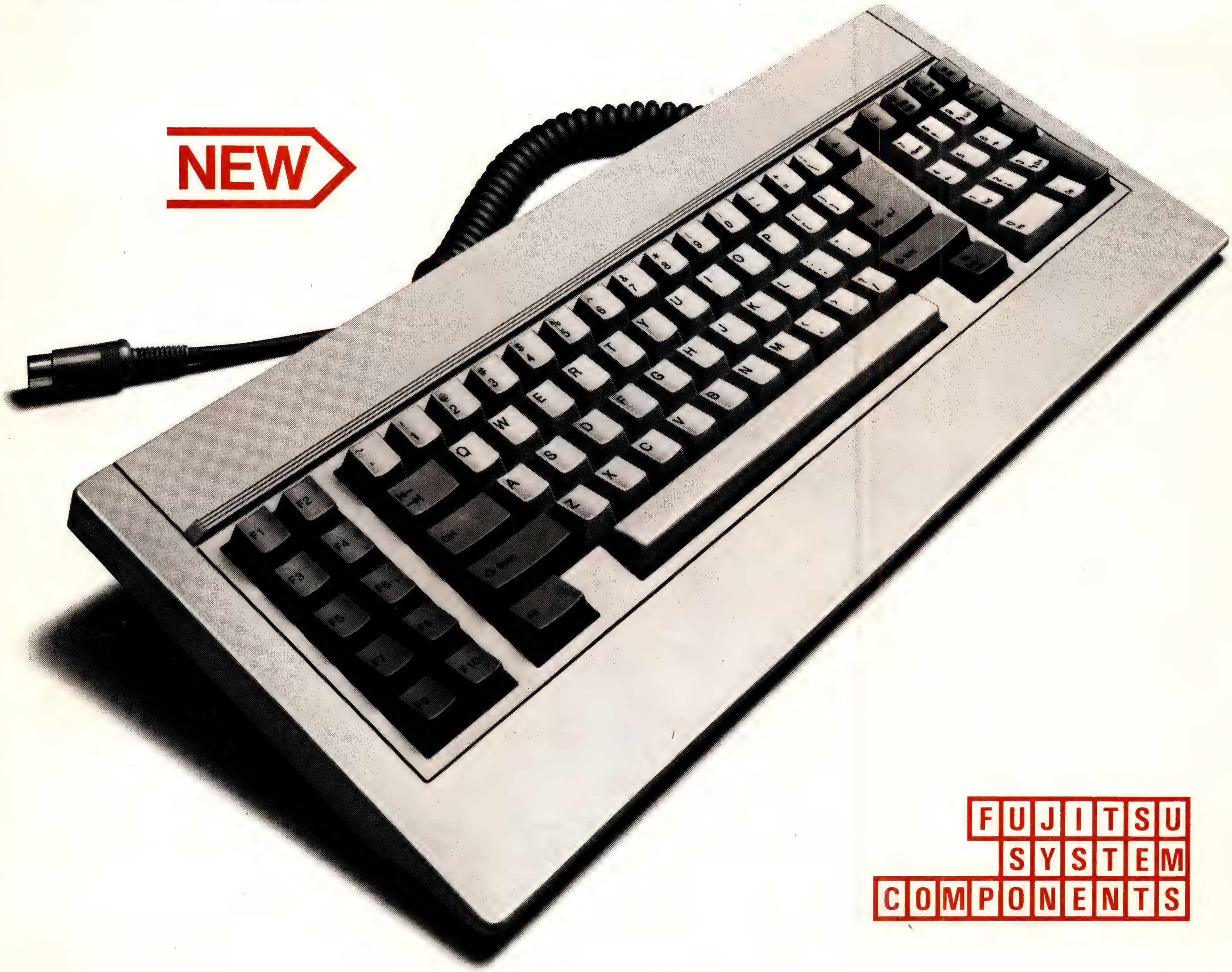


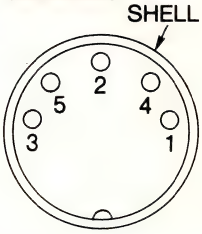
FUJITSU
SYSTEM
COMPONENTS

Fujitsu's FKB 2770 series is a new standard in keyboards for personal computer applications. Their superior reliability is based on the use of Fujitsu's high-reliability one-chip microprocessors and key switches which feature a service life of over 50 million operations with a failure rate of below 20 FIT. Advanced ergonomic design has resulted in rectangular cylindrical keytops, low-profile step sculptured keys and a two-level tilt mechanism (5° and 10° selectable) that together ensure ideal operating comfort. Synchronous serial data transmission guarantees efficient interface.

Connector Pin Assignment

Pin number	Signal
1	CLOCK
2	DATA
3	N.C
4	GROUND (SG)
5	+5Vdc
SHELL	GROUND (FG)

DIN Connector (shielded)



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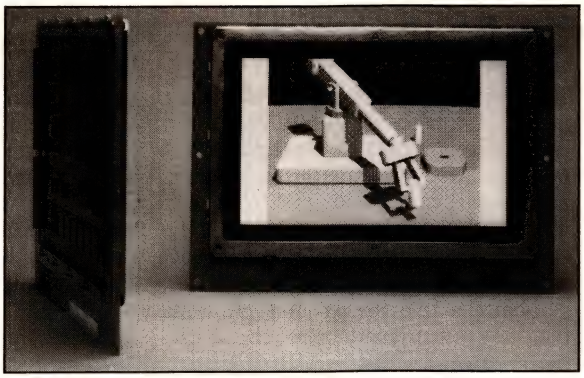
FUJITSU

Circle 75 on reader service card

a resolution of 256 by 512 pixels and measured ¾ in. thick. The EL8358 M is suitable for portable-computer and industrial-control applications because it is both light and rugged. The monitor weighs less than a pound and has a 2:1 pixel aspect ratio.

The panel boasts a 5-by-8-in. (127-by-203.2-mm) active display area and has a vertical resolution of 83 lines per inch (33 lines per centimeter). Its bright, crisp image matches the graphics capability of a medium-resolution CRT.



THIN IS IN. Planar's thin electroluminescent display will soon appear in a major computer company's new laptop unit.

Each pixel is individually addressable, producing a sharp display image. The EL8358 M's MS-DOS compatibility allows full character use of virtually all word-processing, graphics, and utility packages designed for computers operating under MS-DOS. Previously, such extensive use could be attained only with high-resolution CRTs.

SHOCK RESISTANT. Because the display monitors are based on solid-state technology, the panels can withstand harsh industrial conditions. These new monitors can take shocks of 100 g in all axes, are unaffected by electromagnetic radiation, and operate over a temperature range extending from 0°C to 55°C.

The basic monitor film structure is similar to that of all current Planar panels [*ElectronicsWeek,* Jan. 7, 1985, p. 45]—the patterned transparent front-column electrodes are made from indium tin oxide. A bright-yellow emitting phosphor layer is sandwiched between two dielectric insulating layers followed by intersecting aluminum row electrodes. The panel uses gold metallized contacts that are arranged in a single row along the panel edge, which makes for easy assembly. *–Tom Manuel*

Planar Systems Inc., 1400 N.W. Compton Dr., Beaverton, Ore. 97005.
Phone (503) 690-1100 [Circle 339]

HEAT SENSOR TIES EASILY TO PC FOR ROOM CONTROL

Easy-to-install interface hardware will make it much simpler to build microcomputer systems that monitor and control physical events in a factory, office, or home. The first product of the Real-World series from Industrial Computer Designs Inc. is the RTS-1 remote temperature sensor, which is compatible with the wide range of analog-to-digital converter boards already on the market, including boards the company makes for the IBM Corp. Personal Computer.

The RTS-1 sensor resembles a wall-mounted light switch and can be mounted using ordinary electrical hardware. It converts the room's temperature into relative dc signals in the range of 0 to +5 V. Its low-voltage output allows low-cost telephone wiring to be used for connecting the sensor to an ADC board in the computer. The sensors sell for $32 and are available now.

"Many manufacturers such as ourselves are offering analog interfaces, but no one is providing the razor blades [sensors] to go with the razors," says Michael V. Ragsdale, Industrial Computer Designs' president. "Since no one was offering an affordable sensor solution, we set out to develop a practical line ourselves."

MORE TO COME. The company intends to add new sensors to the Real-World series during the fourth quarter of 1985, including sensors for humidity, air velocity through ducts, motion detection, and security. All of the sensors and controls require just a single wire for communications to or from the converter board in the host computer, accompanied by a +8-V dc power-supply wire and ground. The analog voltage range used (0 to +5 V dc) is standard both in industrial and consumer electronics.

Previously, computer hobbyists, architects, and others wishing to explore the environmental-control area have had to adapt costly commercial equipment to perform such functions as energy management, lighting control, computer-supervised security, and irrigation.

The basic electrical format of the Real-World series circumvents certain technical problems presented by other forms of remote-control technology, including the powerline-carrier systems generally accepted as standard for such home-control applications.

A drawback of the powerline format is that an ac line may not appear at the mounting location of the sensor, often requiring an electrician to route a new circuit. By using low-voltage wiring for sensing and control, the company avoids complicated internal-communications and line-interface circuitry, which depends on the stability of the ac power circuits for operation. *–Ellie Aguilar*

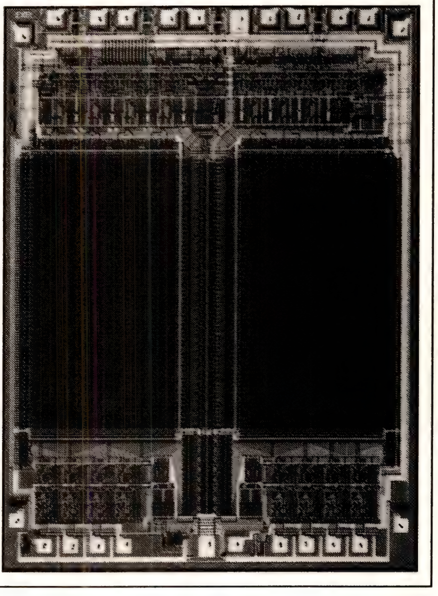
Industrial Computer Designs Inc., 31264 La Baya Dr., Westlake Village, Calif. 91362.
Phone (818) 889-3179 [Circle 340]

16-K EEPROMs ACCESS DATA IN 55 NS

The XL46C15 and XL46C16 are two 2,048-by-8-bit CMOS EEPROMs with read-access times as low as 55 ns. Their output drives are 6 and 12 mA, respectively. Both parts offer current consumption of 90 mA maximum in active mode and 45 mA in standby.

Programmer support is available from outside vendors, or the chips can be reprogrammed in-system with a 10.8- to 20.5-V power supply and support circuitry. The manufacturer recommends the parts for use in high-speed process controllers, robotics, programmable character generators, and video-display pattern generators.

Both chips are housed in standard Jedec 24-pin, 600-mil, 16-K PROM packages. Packaged in Cerdips, commercial-temperature-grade versions with 55-ns access times sell for $24 each in quantities of 100. In the same quantities, mod-



COMPILER GETS NOD FROM DOD

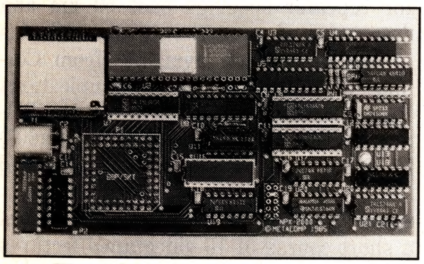
The VAX/Altos cross-compiler generates Ada object code on a Digital Equipment Corp. VAX host computer running the VMS operating system. The output code executes on an Altos Computer Systems ACS 68000 microcomputer running under Unix System III. Validated by the U. S. Department of Defense, the compiler passed the more than 2,200 tests that comprise the Ada Compiler Validation Capability 1.5 test suite.

The company says that this is the first in a projected series of Ada compilers planned for a number of computers. The VAX/Altos cross-compiler sells for $2,500. Delivery begins in November.

Alsys Inc., 1432 Main St., Waltham, Mass.
02154. Phone (617) 890-0030 [Circle 356]

PLUG-IN COMBINES 80186 AND 8087

The NPX-2000, a piggyback module containing an 80186 microprocessor, an 8087 math coprocessor, and proprietary support circuitry, is designed to boost performance of 80186-based microcomputers. The 3-by-5-in. plug-in uses the on-board sockets designed for the 80186. Thus in the space that had been occupied by the 80186 alone, the user gains the computational power of the 8087 as well. The combination speeds performance of trigonometric, exponential, logarithmic, and transcendental functions in hardware.



The price of the NPX-2000 is $825 ordered in quantities of 100. Shipping takes 30 days.

Metacomp Inc., 9466 Black Mountain Rd.,
San Diego, Calif. 92126.
Phone (619) 578-9840 [Circle 348]

MULTIPLYING DAC HAS 12-BIT RESOLUTION

The DAC-8012, a monolithic 12-bit CMOS multiplying digital-to-analog converter, suits applications in intelligent instruments, process control, automatic test equipment, and in other multichannel microprocessor-controlled systems. An on-board memory register lets users incorporate self-diagnostics into the system. The register allows interrogation of set-point conditions in remote data and control systems during fault recovery or normal polling operations.

Maximum gain error for the DAC-8012 is a tight ±1 least significant bit, and its relative accuracy is ±½ LSB. Settling time is 1 µs maximum.

The DAC comes in a 20-pin hermetic DIP. Prices in 100-piece quantities range from $8.28 for the commercial grade to $59.62 for the military grade. Delivery is from stock.

Precision Monolithics Inc., P. O. Box
58020, Santa Clara, Calif. 95052.
Phone (408) 727-9222 [Circle 345]

FEWER TESTS KEEP DAC's PRICE LOW

A trio of digital-to-analog converters for low-end applications claim fewer guaranteed specifications and therefore undergo less testing than do their fully specified counterparts. Thus they are considerably less expensive. All come in molded-plastic DIPs and operate in the commercial temperature range.

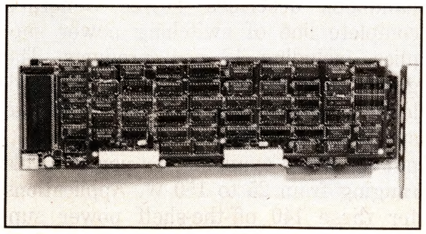
The DAC1200KP-V is a monolithic voltage-output 12-bit DAC that comes with internal reference and output operational amplifier. It sells for $5.95 each in quantities of 100. The DAC1201KP-V, a similar unit with a microprocessor interface, sells for $6.95 in quantities of 100. The DAC1600KP and JP are 16-bit DACs with monotonic signals guaranteed at 13 bits for the KP grade and 14 bits for the JP grade. The KP sells for $8.95 and the JP for $9.95.

Delivery, which is from stock, takes up to four weeks.

Burr-Brown Corp., International Airport Industrial Park, P. O. Box 11400, Tucson,
Ariz. 85734.
Phone (602) 746-1111 [Circle 347]

COPROCESSOR CUTS IMAGE-STORAGE SPACE

CompressIt, an IBM PC-compatible coprocessor, reduces the memory needed to store bit-mapped images. A continuous-tone gray-scale image, for example, takes up one half to one quarter the memory it would otherwise require. The board executes the compression algorithms approximately 10 times faster than an assembly-language program on the IBM PC/XT, the manufacturer says. Its high performance is achieved through use of Schottky logic and proprietary extended microcode addressing.



CompressIt requires a single expansion slot in the PC. It sells for $995 and delivery takes two to four weeks.

Chorus Data Systems Inc., 6 Continental
Blvd., P. O. Box 370, Merrimack, N. H.
03054. Phone (800) 624-6787; in New
Hampshire, (603) 424-2900 [Circle 352]

ONE CHIP CONTROLS FLOPPY, HARD DISK

The single-chip µPD7260 controls both hard- and floppy-disk drives. Because these functions traditionally have been handled by separate chips, its use means a reduction in chip count and a saving of board space.

The n-MOS unit controls up to four disk drives and offers a data-transfer rate of 6 Mb/s. The company recommends it for applications in personal computers, word processors, instrumentation, process control, and business systems. Samples are available now, with production quantities to come later this quarter. In a 40-lead ceramic DIP, the µPD7260 will sell for under $25 each in 10,000-piece lots next year.

NEC Electronics Inc., 401 Ellis St., P. O.
Box 7241, Mountain View, Calif. 94039.
Phone (415) 960-6000 [Circle 349]

CMOS MULTIPLIER WORKS IN 75 NS

The MP1010 is Micro Power Systems' first multiplier-accumulator, a chip that multiplies 16-bit numbers in 75 ns and holds a 35-bit result. It also performs 2's complement, selectable accumulation, rounding, and preloading of a constant into an output register.

Because all inputs and outputs feed individually clocked registers, system throughput is maximized, and the bus interfaces are simplified. The CMOS part consumes just 125 mW, operating from a single +5-V power supply, because it is manufactured in the company's patented 2-µm molybdenum-gate technology.

Three-state output drivers permit the MP1010 to be used on a bus or allow the outputs to be multiplexed over the same 16-bit lines. The MP1010CD in a 64-pin ceramic package sells for $75 in quantities of 100. The MP1010MD/883 sells for $300 in the same quantity and packaging. The MP1010 is also available in die form. Samples are available immediately, but production quantities will be delivered about six weeks after ordering.

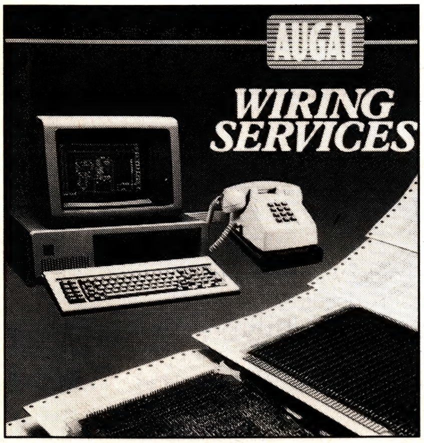
Micro Power Systems Inc., 3100 Alfred St.,
Santa Clara, Calif. 95054.
Phone (408) 727-5350 [Circle 350]

works and packet-switching. Lecture notes and textbooks accompany the videotapes. The course description comes from the Division of Continuing Education, CSU, Fort Collins, Colo. 80523, or call toll-free (800) 525-4950; in Colorado, (303) 491-8417. [Circle 426]

VAX-COMPATIBLE. Products compatible with Digital Equipment Corp.'s VAX, MicroVax, Q-bus, and Unibus are presented in this free catalog. In presenting each product, the manufacturer describes how it complements, enhances, or exceeds the capabilities of standard DEC offerings and illustrates the entry with a photograph. Prices are included. Interested parties should call MDB Systems Inc. at (714) 998-6900 or write the company at 1995 N. Batavia St., Orange, Calif. 92665. [Circle 427]

BENCHMARKS. "Ten Questions Prospective CAD Customers Should Ask Before a Benchmark" is a free bulletin for designers of pc boards. The questions are based on criteria that Calay Systems Inc., a vendor, developed to cover all points in a comparison of its designs with those of its customers. Calay Systems stresses that until customers demand it, the industry will have no uniform standard for benchmarks. For a copy, call (714) 863-1700 or write to the company at 2698 White Rd., Irvine, Calif. 92714. [Circle 428]

INTERCONNECTION. A 12-page color brochure on wiring services describes Wire-Wrap, Stitch-Wire, and Unilayer II wiring technologies. For fast prototype turnaround, the company stocks VME, Multibus I and II, and IBM Corp. Personal Computer standard panels, among others. From the same source, a 15-page "Multibus Products Guide" explains how to order Multibus card-cage products. Both brochures are free from Augat Inc., Systems Division, P. O. Box 1037, Attleboro, Mass. 02703. Phone (617) 222-2202. [Circle 429]



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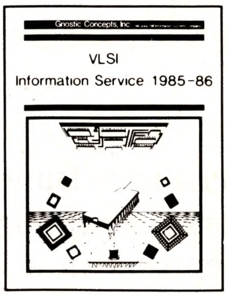
Circle 69 on reader service card



Electronics November 25 issue

For Space Reservations Call: Production Department (212) 512-3140

Battle of the Buses

VMEbus versus Multibus II—who will be the winner in the competition? Ready to jump into the ring as well are relative newcomers Futurebus and NuBus. This article will also examine bus structures for 8-bit systems.

The Market
$1.2 billion by 1985, and $2.5 billion by 1987.

Target Readers
System integrators, systems designers, computer manufacturers.

Issue Date: November 25, 1985
Closing for Advertising: November 4, 1985

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1. Sales through dealers and carriers, street vendors and counter sales		
2. Mail Subscriptions	93,796	87,696
C. Total Paid Circulation	93,796	87,696
D. Free distribution by mail, carrier, or other means samples, complimentary, and other free copies	8,828	6,819
E. Total distribution	102,624	94,515
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1. Office use, left over, unaccounted, spoiled after printing	2,279	417
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G. Total	104,903	94,932

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